REPORT OF PROCEEDINGS

NORTH CENTRAL REGION

LIVESTOCK SPECIALIST CONFERENCE

May 10-13, 1965
University of Wisconsin
Madison, Wisconsin

UNITED STATES DEPARTMENT OF AGRICULTURE
Federal Extension Service

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NORTH CENTRAL REGIONAL LIVESTOCK EXTENSION CONFERENCE
Wisconsin Center, University of Wisconsin, Madison
May 11-13, 1965

PROGRAMMING FOR QUALITY MEAT PRODUCTION

Tuesday, May 11 - Wisconsin Center Auditorium

Chairman - D. H. Williams, Assistant Director of Extension, Wisconsin

8:00 a.m. - Registration

8:30 a.m. - WELCOME - Dean G. S. Pound, College of Agriculture, University of Wisconsin

9:00 a.m. - CHALLENGES TO THE EXTENSION LIVESTOCK SPECIALIST - H. L. Ahlgren, Associated Director of Extension, University of Wisconsin

10:00 a.m. - SYNTHESIZED "MEAT" PRODUCTS - M. J. Walter, Department of Public Relations, American Meat Institute

10:45 a.m. - NEW MEAT PROCESSING AND HANDLING TECHNIQUES - R. W. Bray, Chairman, Department of Meat and Animal Science, University of Wisconsin

11:30 a.m. - DISCUSSION

Chairman - R. H. Vilstrup, Wisconsin

1:00 p.m. - MEAT -- THE PRODUCT WE SELL - Qualitative and Quantitative Factors Used in Determining Pricing and Market Outlets of Meat Products

1:15 p.m. - PORK - E. J. Briskey, Wisconsin

2:00 p.m. - LAMB - B. D. VanStavern, Ohio

3:00 p.m. - BEEF - R. E. Rust, Iowa

3:45 p.m. - DISCUSSION - Q. E. Kolb, Wisconsin, leader

4:30 p.m. - TOUR - Campus Facilities

Wednesday, May 12 - Arlington Farm Research Center

Chairman - V. L. Felts, Wisconsin

8:30 a.m. - LIVESTOCK EXPERIMENTS IN PROGRESS

10:00 - 12:00 a.m. - EXPERIMENTAL PROGRAMS
Specialists will attend program of their choice to appraise research in progress (Wisconsin Staff)

BEEF RESEARCH - V. L. Felts, chairman
Nutrition - V. H. Brungardt
Breeding - E. R. Hauser, A. P. Chapman
Physiology - L. E. Casida

SHEEP RESEARCH - R. H. Vilstrup, chairman
Breeding - A. L. Pope, A. P. Chapman
Physiology - L. E. Casida, N. L. First
Nutrition - A. L. Pope

SWINE RESEARCH - F. J. Giesler, chairman
Physiology - N. L. First, L. E. Casida
Nutrition - R. H. Grummer
Breeding - A. P. Chapman, N. L. First

1:00 - 5:00 p.m.- SPECIES - ORIENTED SECTIONS

BEEF CATTLE - Chairman - R. E. Jacobs, Minnesota

"Comparison of the various state beef cattle performance testing programs"
M. Kirkeide, North Dakota

"Beef cattle breed association herd improvement programs"
V. H. Brungardt, Wisconsin

"Genetic improvement potential of economically important traits, through beef cattle breeding programs"
E. J. Warwick, U.S.D.A.

Discussion period -- program speakers will serve as resource panel

SHEEP - Chairman - H. Mayo, Purdue

"Our experiences with several breeds of sheep at Spooner, Wisconsin"
A. L. Pope, Wisconsin

"Management of ewes and rams to produce fall lambs in Kansas and Oklahoma"
V. E. McAdams, Kansas

Examples of Outstanding Lamb Production
(Round table discussion by representatives from each state)

SWINE - Chairman - M. D. Whiteker, Iowa

"Challenges and changes in swine production from now until 1975"
R. H. Grummer, Wisconsin

"Problems and changes in the swine industry by states"
C. Christians, Minnesota; R. Hollanbech, Purdue; M. Bradley, Missouri; and L. E. Lucas, Nebraska

Thursday, May 13 - Wisconsin Center Auditorium

Chairman - F. J. Giesler, Wisconsin

8:00 a.m. - ADAPTING TECHNOLOGY AND MODERN COMMUNICATIONS TO LIVESTOCK MARKETING -
R. H. Vilstrup, Wisconsin

9:00 a.m. - SPECIES - ORIENTED SECTIONS

BEEF CATTLE - Chairman - J. J. O'Connell, South Dakota

"Practical slaughter cattle finishing programs"
P. Guyer, Nebraska

"Year round dry-lot beef cow herd management versus pasture-wintering feeder cattle production systems"
R. E. Jacobs, Minnesota

"Up-to-the-minute beef cattle nutrition research"
N. Gay, Iowa

DISCUSSION

SHEEP - Chairman - R. H. Grimshaw, Ohio

"Successes and problems in promoting lambs and wool"
R. D. Biglin, Manager of Public Relations, American Sheep Producers Council

"Local promotion efforts that have paid off"
B. E. Taylor, Manager of Market Research Department, American Sheep Producers Council

Round table discussion by representatives from each state.

SWINE - Chairman - K. O. Zoellner, Kansas

"Swine A. I.; Present and Future"
N. L. First, Wisconsin

DISCUSSION

Chairman - M. W. Soults, Iowa

1:00 p.m. - CONTROVERSIAL SUBJECTS
How can we discharge our educational responsibility
D. Spurlock, Public Affairs Specialist, Federal Extension Service

1:45 p.m. - DISCUSSION

2:00 p.m. - WORKING WITH SPECIAL AUDIENCES
M. W. Soults, Iowa, Moderator

Panel Members represent special audience viewpoints

M. Bradley, Missouri
Commercial Farmers

G. R. Carlisle, Illinois
Marketing Firms

D. C. Williams, Nebraska
4-H Members

Q. E. Kolb, Wisconsin
Meat Processors and Retailers

C. Christians, Minnesota
Breeders of Registered Animals

3:15 p.m. - WHAT KIND OF AN EDUCATOR ARE YOU?
F. H. Baker, Extension Animal Scientist, Federal Extension Service

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CHALLENGES TO THE EXTENSION LIVESTOCK SPECIALIST 1/

I. The following statement taken from the 1921 report of the Extension Committee on Organization and Policy is a reasonably satisfactory definition of the job of State subject matter specialists and an exposition of their importance to the extension system.

"A fundamental principle underlying extension work is that the agricultural college --- and experiment station --- and the U. S. Department of Agriculture have something to extend. If this principle is correct it then makes necessary the employment of subject matter specialists who shall represent the subject matter departments of our colleges and stations and the U. S. Department of Agriculture and who shall assist the county agents in organizing and forwarding their subject-matter programs. These specialists are absolutely necessary to the greatest success of county agent work, and to all cooperative extension work. We recommend that in reports of accomplishment the work done by specialists shall be recognized and their place in the organization shall be clearly shown."

II. Place in the organization --- mainly advisory rather than executive. The specialist performs a staff function and is not responsible for administrative matters. He is the advisor --- the consultant --- the source of information for line personnel. He is the resource person upon whom the line personnel must rely. While his is a staff function --- he exercises an authority that is no less real than the line authority --- even though it includes no right to command --- his is the authority of ideas.

III. The Functions of Specialists (9 studies have been published)
(8 studies not published)

A total of 15 functions of specialists were identified in a study conducted in Wisconsin in 1953. They were:

1. Keeping agents supplied with technical information and developing agent understanding of its application.

2. Supplying background and outlook information in the specialist's field to aid counties in program planning.

3. Developing and supplying to agents visual aids, outlines and materials in the specialist's field that can be used by the agents in carrying out the county program.

1/ Presented by Henry L. Ahlgren, Associate Director of Extension, University of Wisconsin, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

4. Helping agents develop necessary project or teaching plans in the specialist's field as indicated in the county program of work.

5. Keeping agents and district leaders posted on resources in their field --- new books, bulletins, articles, movies, equipment, etc. (These five were considered to be of major importance in the study conducted in our state in 1953.)

6. Acting as a resource person for county personnel to phone, write or service immediate and pressing problems.

7. Maintaining two-way relationships with industries in their field, keeping them posted as to recommendations being made in extension and vice-versa.

8. Helping agents evaluate projects they have carried out in the specialist's field.

9. Planning county or area projects in specialist's field to be considered by counties at program planning time.

10. Planning statewide projects in the specialist's field to be considered by counties at program planning time. (These five were considered to be of intermediate importance in our study.)

11. Speaking to lay people at meetings in counties at agent's request.

12. Planning for and/or participating in educational radio programs throughout the state to supplement county extension work.

13. Planning for and/or participating in educational television programs throughout the state to supplement county extension work.

14. Making visits to individual farms or homes in counties with an agent or at agent's request to advise and counsel with individuals.

15. Training local leaders in the specialist's field within the county.
(These five functions were considered to be of relatively minor importance by our staff.)

To these I would add:

1. Transmitting problems and needs of people to research, resident teaching staff members and extension administrators.

2. Establishing and maintaining good working relationships with

extension colleagues --- subject matter department associates --- workers in other state and federal agencies.

3. Building and maintaining good public relations for the Extension Service and the College of Agriculture.

4. Keeping county agents informed of research in progress.

5. Serving on committees.

Someone has said that "the specialist is like a fire department, ready to go where there is need, but when not in the field, he is busy keeping himself and his equipment in condition."

Perhaps I can summarize what I have said up to now as follows:

In the Extension organization, specialists are usually thought of as occupying staff rather than line positions. While extension specialists have no authority to give orders, their word and presence are authoritative. Theirs is the authority of specialized knowledge and whatever personal respect they can command. To serve effectively, an Extension specialist must be:

1. A student.

2. A teacher -- writer, speaker and actor.

3. An interpretor of knowledge.

4. A consultant and counsellor of county staff.

5. A planner and organizer.

6. An evaluator -- to determine effectiveness of his program.

7. Skillful in working with people.

8. Respected and persuasive.

9. An advisor to Extension Administration -- and his colleagues in resident instruction and research.

10. A coordinator of his own activities with those of other specialists in related fields.

11. Able to build and maintain good public relations with farm, business, industry, and professional groups and individuals.

IV. Challenges to the Extension Livestock Specialist.

I am sure it will not come as news to anyone here when I say that social and economic changes in recent years --- giving more and more impetus to specialization --- are bringing changes in the

administration and conduct of Extension work. As I see it, the following are the important challenges facing Extension Livestock Specialists:

1. Finding time to be a student --- carrying out an adequate program of professional improvement so that he is always in a position of being current.

2. Working effectively as a member of a team --- more and more the emphasis in programming must be on "problem solving" rather than along "subject matter" lines. In this setting, the specialist must see and understand his role and his place in the "total package" and his vision must be much broader than his own subject matter "fence lines".

3. Finding ways to reach his clientele with programs in depth.

4. Developing more effective liaison and appropriate educational programs for the many service industries associated with livestock production.

5. Finding the time and resources to conduct applied research to fill present gaps in knowledge.

6. Keeping the administration informed of needs --- for additional state specialists to serve more specialized needs ---and for area specialists.

7. Improving his own efficiency and effectiveness --- as they relate to his own activities and projects --- by careful evaluation.

8. Putting first things first so as to make for the best possible use of time and resources.

Might I say in concluding that your true value lies in your ability to generate ideas and in your effectiveness in imparting these ideas to the whole organization --- so that they become realities where they really count --- that is in the feedlot --- in the market place --- and ultimately on the consumer's table. You are the real generators of our educational programs in the field you represent. When you provide the "right fuel" the engine runs smoothly and effectively. When "the fuel" is low grade we "stutter" and even fail. Fortunately, that hasn't happened very often and it is to your credit that such has not been the case. You are to be commended for arranging for this workshop. I fully expect that it will help to "tune your motors" to the high level of performance you are determined to provide.

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SYNTHESIZED "MEAT" PRODUCTS 1/

It is a particular pleasure for me to be here today with you because as I glance over the attendance list I notice many friends from Iowa State University. Some of these people such as Bill Zmolek, Tom Wickersham, Bob Rust and others have been influential in my way of thinking and I am pleased that you have asked me here to discuss a subject I supposedly know a little about. They have been teaching me various subjects for a long time and I hope that today I will be able to inform them and you a little about these synthesized meat products.

It has been stated many times that the world will soon experience a great protein shortage, if it is not already feeling the effects of such a shortage. With 40% of the population under 20 years of age, the prospect of a protein shortage seems almost unavoidable.

Many theories have been proposed which try to minimize the importance of this problem, but no matter how the picture is painted, it seems imminent that we do face a very real problem in meeting our dietary protein needs in the future.

It has long been known that meat is our best source of protein. Meat is at the same time without peer in consumer food preference. Almost everyone enjoys meat of one type or another and, up to this time, consumers have not balked too much at paying the price commanded. The texture, flavor and nutrient qualities seem to be reward enough for the consumer dollar.

At the same time, we must remember that meats are one of the most expensive food items on our market and therefore are vulnerable. Because of price, many men have been diligently researching the area of possible substitutes for this item, which unfortunately, a few people know as a "luxury".

Today we have a substitute on the market which could possibly have a substantial effect on per capita consumption of red meat in the future. The product is made from soy and wheat protein and is flavored with synthetic meat flavors.

We will discuss the details of production and product characteristics in a minute, but first let us take a look at the simple economics of the product at hand. It seems logical that we should be able to more economically harvest protein from plant sources without first "running" it through livestock and reconverting it into an edible product. If these simulated meat

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1/ Presented by M. J. Walter, American Meat Institute, Chicago, Illinois at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

products can be perfected in texture and flavor, and if the price can be made reasonable, it also seems logical that they might play an increasingly important role in the food industry.

We need only to think of vegetable products, which now capture over 60% of the spread market, to realize the importance a substitute can be to an industry.

It is presently estimated that there are 55 million Americans who, for some reason or another, do not eat meat every day of the week. These people offer a potential market for the "infant" industry.

Let me say at the outset that I am not here today to criticize substitute products, nor am I here to argue the nutritional qualities of red meat. As I analyze the assignment, it appears most appropriate to inform you of what I know about new developments in this area and then ask that you form your own opinions as to the future of the simulated meat products. After all, most of you here today are both older and wiser than I and although I, perhaps, know a little more about these new products, I doubt that any predictions by me would have a major effect on your future thinking.

I must also point out that many of the processing procedures are both highly technical and closely guarded secrets and I am afraid that only a very few people completely understand all aspects of the production techniques. I will be happy to answer any questions you might have, but will hold my breath in hopes that there are no bio-chemists in the audience with technical questions.

Now, let us proceed with a general look at these products and then get into production processes.

Today, a whole array of simulated meat products made from edible spun soy protein is being produced and marketed. Many new lines will soon be available and will be placed in competition for the highly sought after consumer food dollar.

These meat-like, but meat-free foods offer possibilities as items to be served by the housewife to her family or to be used as ingredients in various foods produced by other food manufacturers. The target of many producers is the casserole dish.

Nutritionally, these products offer food values somewhat comparable to that of their meat counterparts, but without the problems of bones and fat.

Processors state that from an economic standpoint, there are potential savings available in price, storage and convenience of use. Recipe possibilities are numerous--and this statement can not be disputed.

The development of edible spun soy protein makes it possible to

produce food products having controlled characteristics of texture, flavor and color, as well as controlled levels of food value. For example, for those people who are leary of animal fats--it is now possible to produce a simulated ham which is supposedly similar to real ham, but which can be produced with less than 1% fat, none of which is animal fat.

Foods resembling chicken, beef and pork and having a protein content as high as 30% are presently being produced.

The versatility of these products makes them adaptable for use as basic ingredients in other food products. The ability to control texture, flavor, food value and portion size makes it possible to customize ingredients products to meet specific needs.

Simulated meats are presently available in a variety of forms, both as to type and size. For example, a product resembling whitemeat of chicken can be supplied in roll form, or it can be made available in sliced, diced, or strip portions. It can be produced in fresh, canned or frozen form, either with or without gravy.

After listening to the last few paragraphs, you are probably wondering how many shares of stock I might have in Worthington Foods or one of the other producers. Well, I will assure you that I have none. As was mentioned earlier, I feel it essential that all aspects of these products be given a truthful analysis. I do not feel that most of the claims made by the producers are out of line. These products do have their advantages and these advantages must be pointed out when discussing the role they may play in the future.

Let us examine the various types of edible soy proteins available to the food industry for use in their products.

1. Soy flour - contains 50% or more protein on a dry basis and is used mostly in breads and breakfast foods.

2. Soy protein concentrate - contains 70% or more protein on a dry basis and will possibly come into greater use as an emulsifier and binder in sausage-type meat products.

3. Isolated soy protein - contains not less than 90% protein on a dry basis and is defined as the proteinacious fraction of soybeans prepared from high quality, sound, clean, dehulled soybeans by removing a preponderance of the non-protein components.

It is this last product, isolated soy protein, that we are concerned with today. I will attempt to outline the production process as we see it today. Please keep in mind that these processes may vary between producers. In the process of

manufacture, the dehulled soybeans are flaked, defatted by hexane extraction and the protein is removed from the defatted flakes by acquenous extraction at pH 8, along with nonprotein soy solubles, in the form of a soy "milk" (defatted). After separation of the milk from the flake residuum, the protein is precipitated by food grade acid to form a protein "curd", which is separated from the whey, washed and concentrated.

The protein is then ready for use. The purified soy protein (1) is mixed with acqueous alkali (2). This product is then centrifuged, resulting in a precipitate that is discarded and an alkaline extract containing the dissolved protein (3). The alkaline extract is treated by adjusting pH to, or near, the isoelectric point (pH 4-4.5) bringing about a "sloppy cottage cheese"-like product (4). Centrifugation of this curd yields protein product of 95-98% purity and 20% solids. Adjustment of pH to 11 or 12 with alkali results in a honey-like dope which is forced through a nylon spinnerette (7). The spinnerette has from 5,000 to 15,000 holes in it and thus produces several thousand fibers of equal diameter and strength. It is submerged in an acetic acid bath (pH about 4 or near the isoelectric point) causing a precipitate with realigned protein molecules. Fiber diameters between .002 and .008 inches seem to be best for tenderness. Fiber strength increases as the viscosity and alkalinity of the dope increases.

The fibers are then lead over a series of rollers of differing diameter, thus bringing about stretching and increased alignment of molecules. This also has an effect on the tenderness of the product. Increased stress decreases fiber diameter. Stretching tensions as high as 400% have been applied satisfactorily.

If given too much time, fibers tend to bind together, so because of this characteristic, it is necessary to complete the spinning and stretching process within approximately 10 minutes.

At present, most fibers are shipped in an acid state (approximately 3.5) and are then adjusted to a normal "meat" pH (5.6 - 6.4) at the processor's location.

Upon arrival at the processors, or if not shipped, when readied for processing, the filaments must be freed from excess salt solution by soaking in H_2O. This offers another opportunity to control the resultant pH of the product.

After soaking is completed, a binder (serum) is added to give the product more body and to bind it together. Binders include many types, but the most frequently used is egg albumin. Others include such edible materials as starches, cereals, dextrins, other proteins, germs, alginates or carboxy methyl cellulose. These binders perform their function either adhesively or by serving as a matrix in which the filaments are embedded.

The edible binders may be applied in several ways, but the two most common are dusting or else passing the fibers through a liquid bath containing the desired binder.

The final product need not contain more than 50% of the fiber material. The remaining 50% leaves room for tremendous product versatility. Variation of different products will exist in the serum fraction, rather than the fiber fraction.

The fibers are then passed through a solution of animal or vegetable fat, pressed into tows of suitable size, and cut into desired lengths.

Coloring and flavoring can be added at different stages in the process. The two most common times appear to be during the addition of the fat or during the process of adding the binder. The product is then cooked and can be further processed according to the needs of the producer.

Some of you might be wondering about the amino acid balance of these products. Of the ten essentials it appears that the raw product is lower than meat in only two, that being Lysine and Methionine. No figures have been given for the other aminos so there is no basis for comparison at this time.

Several taste panels have been conducted to ascertain the eating qualities of the simulated meat products and I will report briefly on some of the results.

From Pennsylvania State University, Dr. Julius F. Bauermann, Extension Food Technologist, reports the following after conducting a panel study:

1. "Poultry people think mock chicken is fair to poor and mock ham is good. Red meat people express opposite opinions about both items.

2. "When unaware of what they are eating, people generally consider mock chicken very acceptable and often will argue whether it is chicken or turkey rather than it isn't either. The mock ham is usually rated acceptable and is looked upon as a 'cheap meat', something on the order of Spam or Treet. The canned Prime is horrible, the smoked and chipped variety pretty good.

3. "The idea of not knowing what they are eating seems to be very important in the overall success of the products. Proving only that what you don't know won't hurt you, I guess.

4. "More favorable acceptance is achieved when the foods are served in a proper fashion, that is to say as part of a meal suitably garnished. Where they are eaten 'cold' so to speak with no bread or garnish, reaction is not as good although still is satisfactory.

5. "Most people complain of a 'filling' feeling and an undesirable aftertaste with the products. This appears to be lessened by consuming some other foods at the same time."

Professor H. W. Ockerman, Animal Science Department, Ohio State University has studied the production and taste of some of the Worthington Food products and concludes the following:

> "The simulated white meat of chicken is excellent in appearance and the flavor is very good. The 'ham' is a little heavy on salt, and the 'chipped beef' is only fair in flavor."

Other studies indicate that these products are fair but will never be able to replace the taste, texture and aroma of good red meat. It is generally felt that the mock chicken is the best product presently being marketed.

Now, perhaps we should take a look at the companies involved in either production or research of these products. While doing this I'll bring into focus the early development of the product and the current volume of production.

By far the largest market today is made up of members of the Seventh-Day Adventists Church. I might also add that the two companies producing the bulk of the product are loyal to this religion and to a "certain degree" are supported by the church.

First let us briefly discuss Worthington Foods, Inc., of Worthington, Ohio.

Worthington Foods, Inc., Worthington, Ohio
Loma Linda Foods, Arlington, California
Brown's Frosted Foods, Philadelphia, Pennsylvania
General Mills, Minneapolis, Minnesota
Ralston Purina, St. Louis, Missouri
Archer-Daniels-Midland, Minneapolis, Minnesota

At the present time it is possible to make only a calculated "guess" at total production of simulated meat products.

We know that only two producers are marketing a product of any significant volume and most of this product is being consumed by members of the Seventh-Day Adventists Church. Worthington will have a little over $2,000,000 sales this year. After talking to several people, it is estimated, and I repeat, estimated, that Loma Linda will market less than one-fourth of this amount.

Volume is an extremely important question with regard to the economics of production and it is at the same time, one of the most closely guarded secrets of the business.

What about the future of the simulated meat products. Well, as I told you earlier, I am not here to forecast the future. I would like to request that if any of you have ideas along this line, you bring them to my attention.

We at the American Meat Institute feel the best defense is a sound offense. We feel that meat will never be replaced. However, we would be remiss in our responsibility if we did not stay abreast of new developments in the food industry. This we think we have done. We have investigated the area and have tried to uncover the facts. We are in agreement with others in the basic idea that meat products must continue to improve in quality as they have during the past several years. This, we believe they will do.

In closing I would like to quote comments by a few of the thought leaders of the meat industry. I believe their comments will be of interest to you.

First, I would like to relay the thoughts of my major professor while at Iowa State University, Dr. Edwin A. Kline.

> "As I look at this it presents a challenge to the livestock producer to improve the quality and uniformity of beef and pork. If our livestock producers do not meet this challenge then perhaps soybean-meat may take away some of their consumer market. Also this synthetic meat will be improved with years to come. To me this product demonstrates that a man made product is possible. This product is uniform from day to day and week to week. It can be processed with a given fat content. These are more or less my thoughts on this product. It certainly is a challenge to livestock production and meat processing."

Robert Rust, Extension Meat Scientist, Iowa State University

> "I believe it is too early to tell whether or not the synthetic meat products will have an effect on the meat industry. I am sure that they do propose a threat. However, I am sure also that meat has some prestige value which these products lack. This product probably will have some considerable appeal to those who for religious or dietary reasons cannot eat meat at any time or on certain days. This alone can be a sizable market. If the product can be produced cheaply enough, it probably will have an appeal to the low income familes as well.
>
> "The extent to which this becomes a threat to the meat industry, I am sure, depends on the industry itself. Today's consumer is looking for a consistent, uniform product. If the meat industry can consolidate its forces and supply this product, I am sure that it has nothing to fear from this competition. However, as soon as the meat industry begins to ignore this, the threat from outside products such as synthetic meats do become real and serious. A case in point, might be the current attempt on the part of some segments of the beef industry to ignore consumers' discrimination against fat. Regardless of what some segments of

this industry might like to think, the consumer will not buy excess fat for one of two reasons. The first of these is the general reduction in fat intake which has been recommended by most people in the medical profession. The second reason is pure economics of the situation. The more fat in the cut of meat, the less edible portion, and the higher cost of this edible portion.

"I think the meat industry needs to observe these synthetic products very carefully, and particularly if they seem to be developing consumer appeal. At that point, I think it would be necessary for the meat industry to evaluate on what basis this consumer appeal is being developed and then attempt to meet the competition on the same basis. I sincerely hope that the industry does not wait for something to happen and then cry about it later as was the case in both lard and butter."

Dr. D. H. Kropf, Associate Professor, Animal Science, Kansas State University.

"Naturally I am somewhat alarmed over the competition this substitute meat product will provide. I am sure their use will continue to increase. Our only suitable reaction as meat research men is one of pushing toward greater efficiency in production of the red meat animals and also in meat processing. I believe that the purebred cattle, swine, and lamb industry needs to push toward greater use of selection programs involving carcass cutability, carcass quality, and efficiency in gain. I further believe that we must make a greater effort to use semen from sires found to be outstanding. I also believe that the meat industry needs to be extremely careful about their public relations image. By this I mean that they would be conscientious in their efforts to produce only top quality products."

Professor L. J. Bratzler, Professor, Food Science, Michigan State University.

"Inasmuch as meat is not now bought on the basis of nutritional value, it would seem logical to assume that some of the substitutes will be sold but many of the American people are not satisfied with the substitutes of the genuine article. Perhaps the margarine product was an exception, but there is so much prestige and status connected with the serving of meat. Much advertising and promotion would have to be done to erase the stigma that would be attached to serving a substitute. At the same time I do not think that the meat packing industry should feel smug and self-satisfied because there is much room for improvement in the way meat is processed, marketed and presented to the consumer."

Once again I want to thank you for asking me here today. Please contact us at the AMI office, or later today, if you have any ideas as to the future of these products.

I have been criticized by some for openly discussing this product. However, I believe it is important that we all have a better understanding of these products and if you are in a position to add to our knowledge, we would certainly appreciate hearing from you. Thank you.

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NEW MEAT PROCESSING AND HANDLING TECHNIQUES 1/

Prior to discussing some specific changes in meat processing and some of which I visualize will develop within the near future, I believe it might be useful to discuss briefly some of the recent changes that have taken place within the meat industry. In reviewing these developments, we may be in a better position to visualize what lies ahead.

Industry Situation - U.S. and North Central Region

Meat production in the U.S.A. must increase in order to keep pace with the population explosion and continuing climb of per capita real income. A unique situation exists in this country in that we consume 30% of the entire world meat production, yet we possess only 6% of the entire global land mass and 6% of the world's population. It is of paramount importance that we maintain this situation which can be done only through increasing production and improving quality of red meats, both aspects of which depend to a large extent on advances in basic research.

During the last 25 years meat packing plants have doubled in number, and in spite of automation now employ about 40% more people; the dollar value of meat production has doubled. Meat processing plants have followed a similar pattern of growth. Meat production by packers has increased faster than the marketings of meat animals. This differential rate of growth is due almost entirely to the shift in slaughtering from farm and retail establishments. The increase in packing plant numbers has taken place principally in the smallest size group classifications, since decentralization has the advantage of reducing transportation costs, and in general, returns are greater for labor in smaller operations.

The packing industry has and still is experiencing rapid decentralization and the development of medium-volume, independently owned packing companies. National packers have declined significantly in importance in recent years. Thirty-five percent of the packing plants are located in the North Central Region and 24% of the total are located in the eastern section of this region. The packing industry of the North Central Region will expand because of the expected increase in meat animal production in this area.

1/ Presented by R. W. Bray, Chairman, Department of Meat and Animal Science, University of Wisconsin, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

Specialization within the Industry

A marked tendency toward higher degrees of specialization within the industry has persisted since 1900 and has accelerated in recent years. Specialization is evident in slaughtering wherein only one or two species are slaughtered in a plant - less than $\frac{1}{4}$ of the federally inspected packers and less than 1/3 of all large commercial meat packers now handle all three species. Further specialization is evident within specie slaughterers to the point that some plants handle only certain classes (sexes or ages) and grades of meat animals. Specialization in processing has led to the development of companies specializing in the boning of carcasses, fabrication of wholesale cuts, and in the distribution of fresh and frozen meats. This country, since 1940, has experienced a tremendous growth in hotel supply houses and wholesale and jobber suppliers for retail stores. Specialized processes for hides and skins, bones, blood and other products are now well established.

Integration within the Industry

Horizontal integration has and still is present in national packing companies, but they are also vertically integrated through ownership of (1) livestock on feedlots, (2) concentration yards, (3) transportation facilities, (4) processing and distribution facilities, and (5) by-product plants.

Integration, with animal feeding and production, has risen sharply since 1955 because of the necessity to insure adequate animal numbers during periods of normally reduced numbers of livestock. In addition to feeding, packers have continuing arrangements with feedlots on a semi-contractual basis. Packers probably will not become major figures in feeding operations since reports thus far have not shown them to be particularly successful financially in their integrated livestock programs. Furthermore, it is anticipated that major effort will be expended in the technology and processing of quality meat products.

Profits in the Packing and Processing Industries

The ratio of dollar sales and assets in the meat packing industry - a measure of monetary turnover - averages more than five to one, yet the net earnings of meat packers have been notoriously low. This has been a real determent to programs relating to plant replacement, modernization, research and technological innovation. Within the last five years the industry has gone through an adjustment in management, an elimination of obsolete facilities and methods and an increased awareness of quality control, which has created a healthier profit picture. Smaller meat packing and processing firms, in many cases because of more modern equipment, are more efficient than the larger plants.

Meat Retailing

The small retail operation has been virtually replaced by supermarkets. This change has taken place within the last 20 years and reflects changes in population, urbanization, income, consumption patterns, shopping habit and practices, as well as improvement in transportation and communication. Supermarkets have squeezed out the small retail operations through lower costs brought about by discounts, circumvention of certain established supply channels and through specification buying. Since we now have supermarkets competing primarily with one another, more service to the consumer will be sold in the future.

Small retail operations were formerly conducted by people with little training in business or meat selection, but today well trained individuals are required by large retailers for meat procurement, operation of retail counters and market management.

Characteristics of Today's Consumers

Industrial development, increased income, and more leisure time are some of the factors that have brought about significant changes in food buying and consumption habits of today's consumer. Some of these changes are as follows:

1. Women prefer to do all of their shopping under one roof -- called one-stop shoppers.

2. Over 80% of the consumers buy other foods where they buy their meat. Meat is the major force in deciding where a consumer shops.

3. Over 50% of the meat is purchased on Friday and Saturday of each week.

4. Women buy over 75% of the meat.

5. Forty percent of the married women work outside the home. This certainly effects the kind and form of meat purchases.

6. Consumers are more quality conscious than ever before. This includes all consumer goods.

Another area of food consumption, which is increasing in importance is the food service industry. One out of every four meals is eaten outside the home or about 50 million people "eat out" every day. We commonly think of the food service industry as that related to meals served by hotels and restaurants, but we should not forget the rapidly developing needs of people who live away from home in such institutions as college residence halls, hospitals, homes for the aged, etc. The needs of the food service industry are standardization of product in terms of size of serving, quality and convenience of preparation.

To this point we have developed an overview of the changes that have taken place in the industry and have also characterized some of the changes in today's consumer. Perhaps we can now summarize the situation by stating that the future of the meat industry must provide:

1. Quality products - products that will compete effectively with other protein foods.

2. Uniform quality - wherein a product has the same eating and keeping qualities from one purchasing experience to the next.

3. Convenience products - products that can be prepared quickly and easily.

4. Products with a minimum of waste - boneless, closely trimmed products eliminate disposal problems.

Recent and Future Changes

What changes will or have taken place in the processing and handling techniques of meat? In thinking about this subject it becomes apparent that product or quality control and unit packaging of the product, along with the need for automation in order to reduce labor costs, have received major emphasis by the meat industry.

Fresh Meat

Uniform quality in fresh meat products is still largely dependent upon the livestock producer through breeding, feeding and management programs. Undoubtedly significant improvements in meat quality have been brought about through the practices of marketing meat animals at younger ages and by putting more of them through feed lots. In spite of this improvement, there remains considerable variation in muscle quality, some of which producers may never be able to eliminate. Processors are now looking toward the possibility of using ante and post mortem treatments for the standardization of such quality traits as color, firmness, and freedom from excessive moisture losses in the muscle. At Wisconsin Dr. Briskey and his research assistants have done much in this area and at this time at least three major packers are studying the possible application of these research findings to their operations. This may involve carefully controlled ante mortem treatment wherein animals are rested, in carefully controlled temperature and humidity environments or in post mortem chilling procedures. It is apparent that very rapid chilling through the use of liquid nitrogen will alter drastically the post mortem changes in muscle.

Improvement in color, firmness and moisture losses from the muscle are apparent. One major packer is considering the use of liquid nitrogen for chilling pork carcasses.

Liquid nitrogen has been used also for preservation purposes in the shipment of beef. Some packers have routinely used it for quickly bringing down the temperatures of railroad cars after they have been loaded for shipment. In addition to less spoilage, the bloom or color of the meat has been retained more satisfactorily.

The real emphasis on standardization of meat quality in terms of how it eats and keeps has been developed at the retail level. This, as you know, has come about through rigid specifications in purchasing fresh meats. Such specifications have and will dictate the vast majority of our meat animal production.

Recently I visited the Safeway warehouse in Denver and viewed the kind of product control that is prevalent in many large food chains. As I recall, this centralized unit was furnishing the meat - primarily beef - for about 150 stores. Characteristics of the operation were:

1. Rigid specifications - as to U.S. grade, ratio of fat to lean, carcass trim, weight and freshness. Each quarter of beef was carefully inspected upon arrival and if it did not meet the specifications, it was rejected.

2. Immediate removal of certain cuts -- minor cuts used for ground beef and kidney fat. Boneless meat from minor cuts was used immediately for the production of fresh ground meat or for curing as was the case with beef briskets.

3. Carefully controlled temperature and humidity environment for a well planned aging program.

4. Standardized trimming of all wholesale cuts prior to shipment to retail units.

5. A specified cutting, trimming, and packaging procedure at the retail units.

6. A shelf life program which varied for the kind and form of retail cut.

Retailers have been reasonably effective in developing rigid quality control programs; however, it would appear that these programs will become more precise in the future and may well involve the selling of meat

1. Completely boneless and in very uniform sized packages.

2. Uniformly trimmed of excessive external and intermuscular fats - thus providing a very constant lean to fat ratio in retail cuts.

3. In a frozen state - as consumers become adjusted to the cost

of boneless meat, the step from selling fresh to frozen meat will be easier. Differences in cost are now major factors hindering this development.

If these changes develop, specifications for meat purchases by the retailers will become more specific and rigid. The producers will eventually receive the impact of this program.

Meat handling by purveyors will continue to increase in the future. Restaurants, hotels and institutions will require products in specific weight units and of uniform quality and lean to fat ratios. Just as with the retailer, the purveyor of portion cut products will demand his purchases meet rigid specifications.

Processed Meats

Again quality control and reduction in production costs have been the factors responsible for bringing about changes in the processing of meat products. Cured pork products are a classic example of this wherein the industry has gone from the practise of curing hams for about 45 days to curing them in 2 to 3 days. In some cases even less than this is required for bacon. Basically the objectives have been to produce a product

1. Uniform in quality - such as in
   a. palatability
   b. keeping quality
   c. appearance
2. With a lower processing cost
3. Thorough boning, etc. make more convenient sized items.

New technology in the curing and smoking of meat has made this possible. Sausage products over the years have varied widely in quality. The industry is now aware that quality control is an absolute must in sausage products if they are to have good consumer acceptance. The use of good fresh raw materials (which includes meat and spices) and the manufacture of sausage under carefully controlled conditions is a recent development in the industry. The new "weiner tunnel" is an example of a carefully controlled manufacturing program. This allows for complete automation and control over the environment in which the product is produced. The product becomes highly standardized and processed for an especially long shelf life.

The high cost of natural casings has led to the development and use of synthetic casings or machines wherein casings are not needed. Recently a company interested in the use of collagen has started to produce reconstituted collagen casings which are

uniform in strength and adaptable to smoked sausage production. The source of this collagen is young beef hide. Although the cost is higher than the cellulose type casing, it offers promise of recapturing some of the casing market. Additionally it offers the further possibility of use in forming in any shape or size processed meat items. Of course, it need not be removed from the product prior to consumption. Already it is being thought of as a possible means for preparing patties made with weiner formulas for possible competition with the hamburger in roadside eating places.

Summarization

In trying to summarize the developments of the meat industry in recent years, it seems fair to state that these have been related to changes in our mode of living, which, of course, has been highly associated with the technological and economic development of this country. The consumer must be courted and satisfied in terms of uniform, highly desirable meat quality and in a form most convenient for utilization. As stated previously, she is more quality conscious than ever before. This then means that the industry must and will become increasingly more active in quality or product control. No small part of this responsibility rests with the producer of meat animals. He, along with the processor, purveyor and meat retailer, must develop strong quality control programs. Herein lies the success of the meat industry to hold the prestige in the food field. Complete satisfaction with meat in my opinion will go far in restricting the use of other protein foods in the American diet, even though costs may be higher. Herein lies the challenge of the future - for those of you concerned with production your challenge is to make the meat animal producer aware of the need to produce a more acceptable and uniform product, and, of course, provide him with the know-how -- for those of you interested in meats, your challenge is to work with processors and retailers in developing sound quality control programs.

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PALE, SOFT, EXUDATIVE PORCINE MUSCLE AND RELATED STUDIES 1/

It is a pleasure for me to appear before this group of Extension workers. As you are interested in the animal you obviously also have an intense interest in the meat product it provides--for it is the meat product which gives value to the animal. For most of you, perhaps, your only contact with meat or carcasses is through carcass shows or at least after the muscles have been thoroughly chilled. During the post-mortem chilling of muscles there are phenomenal chemical and physical changes which take place. These changes are all involved in the phenomenal transformation of muscle to meat and have a direct influence on the quality of meat that you observe.

These post-mortem changes occur in all animals, but my presentation today will be confined to the pig because, first of all, most of our work has been done on porcine muscle, and secondly, because porcine muscles evidence extremes in quality--directly resulting from post-mortem change. At the outset let me say that the work which I am presenting to you represents the efforts of a large number of my associates, graduate students and post-doctoral fellows. A reference list of our published work, as well as work in press on post-mortem changes, is included at the end of this report. You are invited to specific papers for details and also feel free to contact me directly if I can provide more information for your use.

pH Decline

Immediately after exsanguination, complex biochemical reactions, singly or collectively, regulate post-mortem muscle transformation. The extent of transformation appears to be closely associated with the rate of anaerobic glycolysis in muscle.

The rate of post-mortem anaerobic glycolysis, or the glycogen break-down through various intermediates to lactic acid, may be estimated by measuring the rate of pH decline. These pH decline patterns have been found to be extremely variable in porcine muscle and range from virtually no change or retention of a high pH value to a decline of approximately two pH units within a few minutes after death. The exothermic reactions producing lactic acid, which cause a rapid pH decline, result in the release of a large amount of heat. Consequently, muscle which undergoes this violent glycolysis either attains a higher post-mortem temperature than normal muscle, or has retardation in heat removal to

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1/ Presented by E. J. Briskey, Professor, Department of Meat and Animal Science, University of Wisconsin, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

give a temperature decrease per hour during the initial 2-hr. period much slower than in normal muscle.

Color and Gross Morphology. A relatively slow glycolysis resulting in moderate pH attainment at low temperatures is associated with normal muscle color and gross morphology. These muscles are grayish-pink to red in color, moderately firm in structure and moderately dry in appearance (normal). If pH remains high or at least if it is retarded in rate of decline, muscles remain dark red in color, firm in structure and dry in appearance (DFD). Conversely, a rapid rate of pH decline resulting in acid conditions at a high temperature, is associated with the development of pale, soft, exudative muscle (PSE).

Rigor Mortis

The most climactic consequence of post-mortem glycolysis is the development of rigor mortis. The measurement of the time course of rigor mortis has been accomplished with a specially (Wisconsin) designed "rigorometer" apparatus. As I have shown you a picture of this apparatus, I would like to take just a minute and try to tell you how it works. The "rigorometer" has a solenoid cell, energized by a cyclic timer to release and apply the load in a direction longitudinal to the vertically mounted specimen. A lever attached to the specimen--loading system transmits the extensibility and elasticity of the specimen to the armature of a differential transformer. The AC output signal is rectified and transferred to a DC recording microammeter. Three phases are recorded. The delay phase represents virtually no change in extensibility, whereas the onset phase represents a continuous reduction in extensibility. When all extensibility has been lost, the muscle is considered in full rigor which is termed the "completion" phase.

When the onset of rigor mortis occurs (1) at a high pH, the muscle will usually display a DFD gross morphology, (2) at a low pH as long as there is a long delay phase to permit a sharp decrease in temperature, the muscle will usually display a normal gross morphology and (3) at a low pH, high temperature and short delay phase, resulting from a fast glycolysis, the muscle will usually be PSE.

Rigor Pattern to Protein Solubility

Sarcoplasmic protein solubility in a low ionic strength buffer decreased slightly to moderately during the first 24-hr. post-mortem even though the pH was high and temperature low at rigor onset. However, the extractability was drastically decreased to 55% of the original value when pH was low and temperature high at the onset of rigor mortis. Conversely, myofibrillar protein showed no loss in solubility under conditions of slow pH decline, regardless of temperature at the onset of rigor. When low pH developed at a high temperature, less than 50% of the 0-hr.

fibrillar protein was extractable at the onset of rigor mortis, and only 25% was extractable after 24 hr.

Rigor Pattern to Sarcomere Length

Rigor mortis, by itself is associated with many post-mortem changes in many ways in addition to those that we have just discussed. Recent Wisconsin work quantitatively demonstrated that extent of contraction is related to rigor mortis delay phase duration. The sarcomeres were short (1.6 u) in muscles which had undergone a short delay phase of rigor mortis. However, when the delay phase of rigor mortis was of long duration, the sarcomere shortening that occurred was much less--giving a sarcomere length of approximately 2.0μ. Consequently, it can be stated that the amount of contraction, coincident with rigor mortis onset, is highly dependent upon the duration of the delay phase of rigor mortis. In related studies it was found that the time course of rigor mortis could be predicted through electrical stimulation of isolated muscle strips. Through multiple correlations of stimulatory response, it was possible to account for over 90% of the variations in color and gross morphology of the muscle as well as its rigor mortis duration. It is therefore possible to predict the time course of rigor mortis shortly after death of the animal.

Sarcomere Length and Dark Fiber Content

Normally dark or highly pigmented muscles have not only generally had a slow rate of glycolysis, but they have also appeared more resistant to PSE development. In a recent study of the percentage of dark fibers in various muscles, it was noted that the highly pigmented muscles with a high percentage of dark fibers also had longer sarcomeres. At least these light-colored, inactive muscles, which have the shortest sarcomeres, show the severest PSE condition. The post-mortem tension on a muscle is very important in influencing its sarcomere length when comparisons are made among muscles. The mere vertical suspension of the beef carcass releases tension on the longissimus dorsi, permitting the fiber angles and concomitant sarcomere lengths to change. The angle becomes the greatest and sarcomere the shortest at the area of the lumbar vertebra which may be one reason why the PSE condition is usually most severe at this point.

Relation of PSE Condition to Microscopic Structure

Since the development of PSE muscle is so visually apparent, it also seemed important to look at the post-mortem changes microscopically. When glycolysis proceeded slowly and rigor mortis occurred at a high pH, the muscles appeared DFD and the ultrastructure (electron micrograph) showed a high degree of organization and preservation of myofibrils. Conversely, when the onset of rigor mortis occurred at pH 5.6 within 15 min. after death, the muscle appeared extremely PSE, the fiber bundles seemed to be

disconnected, and muscle exuded excessive amounts of fluid. The electron micrograph of this muscle showed a granular appearance of the A band. These elctron micrographs implicated the disruption of the protein filaments as well as the sarcoplasmic components in extremely PSE muscle.

Differences Among Breeds in Muscle Properties

Another logical question would encompass animal variation in the development of PSE muscle. Although the three breeds which were intensively observed represent restricted lines of breeding, in many cases the observations have been carried through to widespread differences among breeds. In a breed comparison the glycogen content of Hampshire longissimus dorsi muscle at the time of death was two to three times higher than for Chester White and Poland China, respectively. Since in these particular animals, the Poland Chinas had the highest incidence of PSE musculature, the total amount of glycogen apparently was not related to glycolytic rate as long as it had not been previously reduced below a normal level. Sucrose feeding, especially in animals which responded by increasing muscle glycogen, tended to contribute to faster glycolytic rates.

Since it has been implied that muscle phosphorylase preferentially degrades the larger glycogen molecules, it seems reasonable that the branching characteristics of the glycogen may differ under various nutritional and genetic influences, and may be important in the regulation of post-mortem glycolysis. Upon examination of the external and internal chain lengths of glycogen isolated from the longissimus dorsi of pigs from these three breeds, it was found that in all cases the external chain length shortened during post-mortem glycolysis. The Chester White pigs, which exhibited the slowest rate of post-mortem glycolysis, had the highest rate and the greatest amount of alteration in the structure of the glycogen molecule. Conversely, the Poland China pigs had the most rapid rate of glycolysis, while the chain lengths of the muscle glycogen were only slightly shortened during the entire post-mortem glycolytic period. Sucrose feeding, which tended to accelerate glycolysis, elevated muscle glycogen stores and tended to lengthen both the external and internal chain length of muscle glycogen, compared to glycogen from the muscle of animals which had been fasted 70 hr.

The mean total phosphorylase was more than twice as high in Hampshire as in Poland China pigs. The Chester White pigs were intermediate in total phosphorylase activity and were significantly different from each of the other two breeds. It seems pertinent that the Hampshire muscles which had high glycogen levels immediately post-mortem also possessed especially high levels of total phosphorylase. Insufficient knowledge exists on the relation between ante-mortem phosphorylase activation and post-mortem glycolytic rate.

Incidence of PSE Musculature

A survey of 15,000 hams was conducted during the calendar year 1962 to determine the incidence and distribution of PSE musculature in hams by season and environmental temperature. The distribution of daily high and low temperatures throughout the year was also considered. There were severe temperature fluctuations in the spring and fall, and the relatively small temperature fluctuations during the summer. The range of incidence of PSE hams extended from a low of 0% (February) to a high of 46% (October). It seemed pertinent that many of the periods of high incidence corresponded with or paralleled the periods of great fluctuations in environmental temperature. It seemed equally pertinent that, during periods of high mean temperatures, there were large numbers of PSE hams.

Pre-slaughter Environment

An experiment was conducted to show the effect of a specific elevation of environmental temperature on glycolysis and rigor mortis in the post-mortem muscle. The animals were subjected to a temperature of 40-42° C. for 20-60 min. in a temperature control chamber. When certain breeds of pigs were exposed to this warm environment, immediately prior to death, their muscles had a markedly accelerated glycolytic rate and became extremely PSE when compared to unheated animals. A warm environment prior to slaughter caused rapid post-mortem pH decline in the Poland China and Hampshire muscle, whereas Chester White pigs had the capacity to withstand heat, metabolize muscle glycogen, achieve a normal or high ultimate pH and retain a normal musculature. This was particularly interesting since all breeds responded to heat treatment by showing equally elevated muscle temperatures to above 41°C. The muscle glycogen as well as glycolytic intermediates were apparently metabolically depleted prior to death in the Chester White pigs.

The muscles from many of the Poland Chinas were severely affected by heat treatment. Their post-rigor muscles were white and dry and exhibited a very loose, open structure. The gross structure appeared open at all periods after the onset of rigor. An interesting phenomenon was noted when the entire longissimus dorsi was removed from the chilled carcass. After the connective tissue sheath covering the muscle was severed, no further attachments to the vertebra were found, and the muscle was easily pulled from the carcass. Apparently the combination of high temperature and low pH resulted in thermal shrinkage and/or hydrolysis of the connective tissue attachment to the bone or altered the ground substance, allowing release of the muscle.

Combination of Warm and Cold Treatment

In view of the beneficial effects of a rapid change to a cold environment and the deleterious effects of a rapid change to a

warm environment, additional experiments were conducted: (1) To determine if temperature regulation ante-mortem would control the nature of post-mortem glycolysis and thereby prevent the development of PSE porcine muscle and (2) To gain insight into the mechanisms by which ante-mortem temperature and temperature fluctuations contributed to levels of metabolic constituents of muscle at the time of death. Warm, cold and combinations of warm and cold treatments were employed with environmental chambers.

The heat treatment, which accelerated post-mortem glycolysis in the Poland China pigs, apparently caused the lactic acid, produced under stress and/or anaerobic conditions, to be retained in the muscle of the live animal, with a resultant lower 0-hr. glycogen and higher 0-hr. lactic acid content. Conversely, when warm pigs were placed in the cold, the cold treatment allowed accumulated lactic acid to be removed from the muscle. These muscles had a slow glycolytic rate, onset of rigor at a high pH, retention of high solubility of sarcoplasmic and myofibrillar proteins and retention of a high degree of integrity in the ultrastructure of the muscles and visually appeared DFD.

In related studies the physiological parameters of heart and respiration were monitored in an attempt to determine the characteristics of the animals which were resistant to heat treatment. Limited information exists on the association of these physiological parameters of the animal to the post-mortem properties of the musculature. Since heart and respiration rates are associated with blood flow and oxygen supply to the muscle, it was suggested that the initial state of, as well as changes in, these physiological parameters immediately prior to exsanguination, may be associated with the post-mortem properties of the muscle. When there was very little change in heart rate, due to treatment, the muscles were essentially normal. However, when the animals showed drastic increases in heart rates, which, in addition to other factors, reflected a greater need for oxygen during warm treatment, the post-mortem pH decline was extremely rapid and muscles became PSE.

Effect of Exercise and Other Ante-Mortem Treatments

It is also appreciated that many other ante-mortem handling practices may influence post-mortem characteristics of muscle. Exercise, for example, may be an important factor influencing post-mortem muscle changes. An animal exerciser was designed to control the rate and amount of exercise given pigs under experimental conditions. Results of exercise experiments have shown that when administered to exhaustion, in cool environment, the glycogen stores are depleted and the muscles remain DFD. Conversely, if administered under warm conditions the animals seem to go into an oxygen debt and high lactic acid levels exist at death, to be followed by a rapid glycolysis and the development of PSE muscle.

Post-mortem Handling

Since a low pH at a high temperature were associated with the development of PSE muscle, it was felt that a rapid post-mortem reduction in temperature might prevent PSE muscle. Liquid nitrogen treatment prevented the development of PSE muscle. The treatments varied from a severe freeze to a mere surface freeze or freezing of the skin. Likewise these treatments were all effective regardless of whether the hams were equilibrated at 4° C. or -18° C. following the LN_2 treatment. This treatment does slightly accelerate temperature drop within the first 2-hr. period, preserves high sarcoplasmic and myofibrillar protein solubility, and decreases post-mortem production of reducing sugars when compared to control sides. LN_2 treatment serves as an ideal tool for studying PSE and DFD muscle from the same animal. Likewise it is still realized that the basic effects of liquid nitrogen treatment may be indirect through prevention of contraction and/or nerve control. Nevertheless it does emphasize the fundamental fact that the meat processor, through this principle, may be able to through some means, take muscle at the time of death and control or regulate its post-mortem transformation in order to produce uniform pork quality products.

Processing Potential

In a comparison of PSE to DFD muscle, PSE has:

1. Slow cooking rate
2. High cooking loss
3. High juice loss during cure
4. Fast browning
5. High smoking shrink
6. High cured color variability
7. Low protein solubility
8. Low palatability

Commercially, these PSE muscle characteristics represent major economic losses for the processor and are very undesirable for consumer use. For more detailed information the readers are directed to Vol. XIII Advances in Food Research, 1964 (E. J. Briskey), as well as the following articles:

Briskey, E. J., R. W. Bray, W. G. Hoekstra, R. H. Grummer and P. H. Phillips. 1959. The effect of various levels of exercise in altering the chemical and physical characteristics of certain pork ham muscles. J. Animal Sci., Vol. 18, No. 1, pp. 153-157. Feb.

Briskey, E. J., W. G. Hoekstra, R. W. Bray and R. H. Grummer. 1960. A comparison of certain physical and chemical characteristics of eight pork muscles. J. Animal Sci., Vol. 19, No. 1, pp. 214-225. Feb.

Briskey, E. J., R. W. Bray, W. G. Hoekstra, P. H. Phillips and R. H. Grummer. 1960. Effect of high protein, high fat and high sucrose rations on the water-binding and associated properties of pork muscle. J. Animal Sci., Vol. 19, No. 2, pp. 404-411. May.

Briskey, E. J., and J. Wismer-Pedersen. 1961. Biochemistry of pork muscle structure I. Rate of anaerobic glycolysis and temperature change versus the apparent structure of muscle tissue. J. of Food Sci., 26, No. 3, pp. 297-305.

Briskey, E. J., and J. Wismer-Pedersen. 1961. Biochemistry of pork muscle structure II. Preliminary observations of biopsy samples versus ultimate muscle structure. J. Food Sci., Vol. 26, No. 3, pp. 306-313.

Sayre, R. N., E. J. Briskey, W. G. Hoekstra and R. W. Bray. 1961. Effect of pre-slaughter change to a cold environment on characteristics of pork muscle. J. of Animal Sci., Vol. 20, No. 3, pp. 487-492.

Briskey, E. J., R. N. Sayre and R. G. Cassens. 1962. Development and application of an apparatus for continuous measurement of muscle extensibility and elasticity before and during rigor mortis. J. of Food Sci., Vol. 27, No. 6, pp. 560-566.

Sayre, R. N., E. J. Briskey and W. G. Hoekstra. 1963. Porcine muscle glycogen structure and its association with other muscle properties. Proc. of Soc. for Exptl. Biol. and Med. Vol. 112, pp. 223-225.

Forrest, J. C., R. F. Gundlach and E. J. Briskey. 1963. A preliminary survey of the variations in certain pork ham muscle characteristics. Proc. of the 15th Ann. Res. Conf. Am. Meat Inst. Found. pp. 81-91.

Sayre, R. N., E. J. Briskey and W. G. Hoekstra. 1963. Alteration of post-mortem changes in porcine muscle by preslaughter heat treatment and diet modification. J. Food Sci. Vol. 28, No. 3,pp. 292-297.

Sayre, R. N., E. J. Briskey and W. G. Hoekstra. 1963. Comparison of muscle characteristics and post-mortem glycolysis in three breeds of swine. J. Animal Sci. Vol. 22, No. 4, pp. 1012-1020.

Briskey, E. J. 1963. Influence of ante and post-mortem handling practices on properties of muscle which are related to tenderness. Proc. Meat Tenderness Symposium. Campbell Soup Co., Camden, N. J. 195-221.

Sayre, R. N. and E. J. Briskey. 1963. Protein solubility as influenced by physiological conditions in the muscle. J. Food Sci. Vol. 28, No. 6.

Cassens, R. G., E. J. Briskey and W. G. Hoekstra. 1963. Electron microscopy of post-mortem changes in porcine muscle. J. Food Sci. Vol. 28, No. 6, pp. 680-684. (Nature 197, No. 4872 pp. 1119-1120).

Sayre, R. N., Barbara Kiernat, and E. J. Briskey. 1964. Processing characteristics of porcine muscle related to pH and temperature during rigor mortis development and to gross morphology 24 hr. post-mortem. J. Food Sci., Vol. 29, No. 2, pp. 175-181.

Borchert, L. L. and E. J. Briskey. 1964. Prevention of pale, soft, exudative porcine muscle through partial freezing with liquid nitrogen post-mortem. J. Food Sci. Vol. 29, No. 2, pp. 203-209.

Kastenschmidt, L. L., E. J. Briskey and W. G. Hoekstra. 1964. Prevention of pale, soft, exudative porcine muscle through regulation of ante-mortem environment. J. Food Sci. Vol. 29, No. 2, pp. 210-217.

Briskey, E. J. and R. N. Sayre. 1964. Muscle protein extractability as influenced by conditions of post-mortem glycolysis. Proc. Soc. Exptl. Biol. Med. 115, (3):873.

Briskey, E. J. 1964. Etiological status and associated studies of pale, soft, exudative porcine musculature. Adv. Food Research, Vol. 13, pp. 89-178.

Borchert, L. L. and E. J. Briskey. 1965. Protein solubility and associated properties of porcine muscle as influenced by partial freezing with liquid nitrogen. J. Food Sci. 30, 1, 138.

Beecher, G. R., E. J. Briskey and W. G. Hoekstra. 1965. A comparison of glycolysis and associated changes in light and dark portions of the porcine semitendinosus. J. Food Sci. 39, 3, 477.

Kastenschmidt, L. L., G. R. Beecher, J. C. Forrest, W. G. Hoekstra and E. J. Briskey. 1964. Porcine muscle properties. A. Alteration of glycolysis by artificially induced changes in ambient temperature. J. Food Sci. (July-Aug.)

Forrest, J. C., L. L. Kastenschmidt, G. R. Beecher, W. G. Hoekstra and E. J. Briskey. 1965. Porcine muscle properties. B. Relation to naturally occurring and artificially induced variation in heart and respiration rates. J. Food Ci. 30, 3, 492.

Herring, H. K., R. G. Cassens and E. J. Briskey. 1964. Sarcomere length of free and restrained bovine muscles after thaw rigor contracture. Biodynamica (Nov. 1964)

Herring, H. K., R. G. Cassens and E. J. Briskey. 1965. Sarcomere length of free and restrained bovine muscles at low temperature as related to tenderness. J. Sci. Food and Agr. 16,379.

Sink, J. D., R. G. Cassens, W. G. Hoekstra and E. J. Briskey. 1965. Rigor mortis pattern of skeletal muscle and sarcomere length of the myofibril. Biochem. Biophys. Acta. 102, 1, 309.

Herring, H. K., R. G. Cassens and E. J. Briskey. 1965. Further studies on bovine muscle tenderness as influenced by carcass position, sarcomere length, and fiber diameter. J. Food Sci. (In press).

Beecher, G. R., R. G. Cassens, W. G. Hoekstra and E. J. Briskey. 1965. Red and white fiber content and associated post-mortem properties of seven porcine muscles. J. Food Sci. (In press).

Forrest, J. C., M. D. Judge, J. D. Sink, W. G. Hoekstra and E. J. Briskey. 1965. Prediction of the time course of rigor mortis through response of muscle tissue to electrical stimulation. J. Food Sci. (In press).

Eisenhut, R., R. G. Cassens, R. W. Bray and E. J. Briskey. 1965. Fiber arrangement and micro-structure of bovine longissimus dorsi. J. Food Sci. (In press).

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MEAT -- THE PRODUCT WE SELL -- A CONSIDERATION OF LAMB 1/

To set the stage for a consideration of the assigned topic, I would like to share with you a few comments so well expressed by Professor P. T. Ziegler of Pennsylvania State University in his book "The Meat We Eat". Professor Ziegler lauds meat as a virile and protective food -- he cites the biological value of its protein, its vitamin and mineral content, as well as its value as an energy food. Then comes the statement from which I wish to take my text. I quote, "Brushing aside for the moment all that has been said and forgetting high-sounding names, over-zealous scientists and doctors' admonitions, let us revert to plain hungry mortals seated behind the festive board. Instinctively we look for the platter of meat which to most of us is not only the king but the whole royal family of appetite appeal. It transcends all other foods in aroma, causing a watering of the mouth and a conscious glow in the most bulbous organ of the gastro-intestinal tract. It is a psychological stimulus that causes a flow of saliva and gastric juice, preparing the food chamber for the royal guest. And it does not beguile us; it satisfies. It accomplishes this by supplying what it advertises to our nostrils before we consume it. As we crunch its juicy fibers between permanent or removable ivories, we receive our first pleasant realization of a previous longing sensation. As we swallow the tasty mass, we begin to radiate satisfaction in our eyes, in our speech, and in our actions. We become more amiable, more clear-minded, and more reasonable -- certainly a most honorable tribute to any food product."

Can Lamb "Fill the Bill"?

I believe the extent to which each meat product elicits the response described by Professor Ziegler determines its relative desirability. It is my opinion that we need to consider lamb in the light of this criteria. I realize that by asking the right question of the right people at the right time that "consumer studies" can lead us to just about any conclusion we wish to make. At best, the results of specific "consumer studies" have rather serious limitations that are often described by the circumstance of the study. However, even the limitations of such studies do not protect us from a realization that general consumer reaction to lamb as a meat is not overwhelmingly favorable.

I would like, through this presentation, to review some selected research efforts that, in my opinion, are worthy of our

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1/ Presented by B. D. VanStavern, Extension Meat Specialist, The Ohio State University, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

consideration when we think of lamb as an item in the retail meat case. I do not propose to offer solutions to well-known problems, rather I suspect I might very well remind us of problems we had forgotten.

The Situation

Last fall some of us were privileged to participate in a Conference at Iowa State University entitled "The Future For Sheep". The Conference, in addition to other aspects, was instrumental in bringing together a vast amount of information relative to lamb processing, merchandising and consumption. The following points made at the Conference seem relevant to this discussion:

1. Per Capita Consumption of lamb now averages 4.9 pounds as compared with 7 pounds in the 1940's.

2. Lamb meat now represents about 3 percent of the total meat consumed as compared with 5 percent in 1945.

3. The marketing power of large retailers or wholesalers is increasing with retailers tending to buy on specifications direct from warehouses. The specifications are quite variable from retailer to retailer, but tend to be rather exacting in terms of weight, grade and "kind" for a specific retailer.

4. While retailers can make a profit merchandising lamb, pound for pound the cutting and handling costs are greater for lamb than for beef.

5. The consumer, if she wants lamb at all, wants a high proportion lean, with desirable tenderness and flavor.

6. A light leg and a large chop are thought desirable.

7. Some retailers criticize lambs for being too light, but find the heavier lambs have too much fat covering.

8. There is need for a meatier lamb in the higher weight range.

9. There is some dissatisfaction with U.S.D.A. Grades for carcass lambs in that they fail to reflect merit to the consumer.

10. There is some objection to the odor and flavor of lamb.

11. "Packer-preferred" lambs do not produce "consumer-preferred" lamb cuts.

12. Lamb is perishable and traditionally moves from packer to retailer in carcass form.

These are only a few of the observations of the Conference. I

suspect we could debate each of them, but they do seem to present "the situation" rather clearly. The question becomes what can be done to maintain or hopefully improve the "product we sell".

Quantity and Quality is a Concern

The Quantity and Quality of lamb available is a concern. It goes without saying that resident consumption of a product is restricted to the amount that is available for consumers to buy. This has implications to total supply, seasonality of supply and, of course, to the type and cut of lamb being considered. A large supply of lamb breasts will not help lamb consumption if the customer really wants chops or legs. Likewise, because lamb was available last week doesn't help the homemaker that wants lamb this week. This kind of problem, if it were solved, would do much for the total industry. There are, however, some often cited obstacles to a constant supply of the right kind of lamb carcasses and cuts.

In an Ohio study of 210 retail stores the meat buyers indicated that in their opinion retail Meat Department Managers controlled the sale of lamb -- if he was enthusiastic the store moved a lot of lamb and vice versa. The Meat Managers, generally speaking, said that lamb was too expensive to merchandise properly because of low volume. In most cases, buyers said that it was a problem to find a source of a constant level of quantity and quality. In Ohio we have exported lambs and imported carcasses. I am sure we haven't made it easy for retailers to sell lamb in Ohio.

In this same study it was found that major cuts of lamb such as chops, shoulder roasts and legs were offered in about 30-40% of the observations (12 observations/210 stores). Minor cuts were not offered so regularly. This leads one to conclude that the major cuts must return the profit. This one fact alone gives us plenty of reason for emphasizing lamb carcass improvement, but there is more -- product characteristics were studied:

1. Customer Appeal Rating - Appearance of the meat (fresh, stale, dark or dry lean, fatness, etc.) and manner of display (arrangement, packaging, etc.) Results were interesting and tended to identify the type of store.

2. Fatness Rating - Product as presented to customer was studied --- here again extreme differences were observed.

3. Lean Ratio - Percent of lean visible in any cut surface. This as we might expect, was a highly variable figure, but one we found interesting. For example, there was no significant difference between grades of lamb in terms of lean ratio. However, nearly 75% of all stores studied indicated a preference for Federal Grades and justified this by "Consumer Demand", "better quality", "more uniformity", etc.

I cite this study, not for its findings, but to emphasize the importance of a positive approach to lamb carcass improvement.

Improvement Is A Must

The ways and means of improvement or at least evaluation were examined by "The Future For Sheep" Conference. It was apparent that there are many effective ways to evaluate a lamb carcass. The Conference did, however, recognize that a maximum yield of boneless, trimmed "primal" cuts was a worthwhile criteria. This criteria is associated with a high cut-out value. It was also recognized that palatability of this product must be high. Applicable research data to guide our evaluation of quality is limited. This continues to be of concern to all of us involved in lamb carcass improvement work.

Since complete cutability data is difficult or impossible to obtain, short-cuts or workable objective procedures have been sought and several indicies have been developed. For the most part these involve a measure of muscle, a measure of outside fat and kidney fat and in some cases, loineye size. The Iowa folks, for demonstration purposes, ranked lamb carcasses by each of several procedures. In general, I believe they found that each of the index procedures tended to identify the "right-kind" of a lamb carcass. This being the case, uniform carcass appraisal becomes a matter of some uniformity in data collection. I would like to share with you some of our activity in this area.

Ohio Work - - -

1963	-	107	Lambs	5 Sires
1964	-	100	Lambs	4 Sires
1965	-	100+	Lambs	8 Sires

Carcass Data Obtained: - (Slides)

Hot Carcass Weight

Chilled Carcass Weight

Dressing Percentage

Conformation Grade

Quality Grade

(Feathering, Fat Streakings, Firmness)

*(Marbling Score in 1965)

Carcass Grade

Fat Thickness - An Average of 3 measurements

(Fattest point over lower rib was measured, but not used in the average)

(A single 3/4 measurement is also being taken in 1965)

Loin Eye Area - An average of the measurement of each L D Muscle -

Expressed on a unit weight basis (per 50# carcass or per CWT carcass)

Weight of Hind Saddle

Weight of Trimmed Hind Saddle

Weight of Kidney & Kidney Fat

Weight of Legs

Weight of Edible Portion, bone and fat from one leg

Organoleptic Score - 1964 only

Tenderness

Flavor

Acceptability

Ultrasonic Evaluation - 1964

Fat Thickness

Loin Eye Area

Relation to Visual Appraisal

Using this data, we tested a set of "consumer-preferred lamb standards", that included fat thickness, loin eye size and carcass grade. The carcass standards were as follows:

	Number Evaluated in 1964	Number Meeting the Standard
1. At least 2.50 sq. in. of loin eye per 50 lb. of carcass.	100	19
2. Fat thickness over the loin eye at least 0.18 in. & not more than 0.30 inches	100	61
3. Quality equivalent to USDA Choice or Better	100	99

This experience is causing us to emphasize the need for more muscling in lamb carcasses. While loin eye area and total muscling may not be perfectly related, it is apparent that in terms of consumer appeal the number of bites in a lamb chop is extremely important. We can get large loin eyes by marketing heavier lambs, but the physiology of growth tends to limit the desirability of this method. In many cases, we detract from the large loin eye by the additional fat. This seems self-defeating.

We are convinced that the industry is far enough along to be able to evaluate lamb carcasses in terms of consumer acceptability. We need to do this! We also need to be mindful that the visual appraisal of the package can be very important -- All acceptability is not based upon performance. We hope that before long we can relate our visual appraisal of desirability with the many more objective measures currently available and with those that are sure to come.

The positive approach to "this product we sell" can improve it considerably.

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MEAT -- THE PRODUCT WE SELL -- BEEF 1/

In analyzing the factors that affect the pricing of beef products, we could go into a considerable amount of detail at both the producer and packer level. However, since these have received a considerable amount of attention in the past, I think it would be best to concentrate on the affects of what the retailer does and some of his problems in the price of beef. The picture, I am afraid, is not as bright as we would hope.

In a recent study by McKinsey and Company, sponsored by the National Association of Food Chains and the American Meat Institute, some interesting facts concerning the retailing of meat were brought to light. At first glance, beef appears to be in a very favorable position. It accounts for about 48.5% of the total dollar sales volume of the meat department. This gives rise to the feeling in many quarters that beef is a popular product, which it is, and that nothing should be done to disturb this popularity. (Table 1). However, let me point out that broilers, too, are popular. I am sure we are all aware that this industry has suffered some serious financial problems.

As we look at the structure of the meat department itself, however, we find that beef, while it enjoys the greatest volume, is not a big profit contributor to the meat department. Too often it is a volume builder, but it does not have a strong positive affect on the dollar profit of the department. This is particularly true when you assign a direct cost against beef. For example, while beef in this study carried a gross profit margin of 17.8%, its direct product profit margin was a -2.2% (Table 2).

Compare this, for example, with fresh pork with a gross margin of 30.7% and a direct product profit of 11.9% or the delicatessen section of the meat department with a gross margin of 28.9% and direct product profit of 20%.

Two factors contribute to this problem as far as beef is concerned. First of all, beef requires an extreme amount of labor. (Table 3). While it accounts for 62% of the fresh meat tonnage, it requires 68% of the total cutting time. This reflects the fact that it takes longer to process a pound of salable beef than pork or some of the other fresh meat items. Actual labor costs are over 7¢ per dollar of sales (about 5 to 7¢ per pound) for the meat department as a whole. (Table 4, 5, and 6).

1/ Presented by Robert E. Rust, Extension Meat Specialist, Iowa State University, Ames, Iowa, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

This would be proportionately higher for beef since it requires a greater share of the meat cutter's work time than fresh pork or processed meat, for example.

As we look at the overall department cost, we can find figures ranging from 7.8¢ to 9.7¢ per pound. This would include the meat department labor, checkout labor, wrapping, stamps and similar direct costs. Added to this would be such factors as rent and depreciation, utilities, maintenance and repair, and other operating costs that are assigned to the store as a whole. Adding these two costs together, it is possible to find processing and merchandising costs for meat running as high as 11½¢ per pound. On the average, this leaves the market with a return to management of something less than 3¢ a pound. This must cover all of the management costs plus a reasonable return to capital. (Table 7 and 8).

Beef is forced to suffer from its own popularity. As a result of this popularity, it is often used as a loss leader in the market. Unfortunately, the McKinsey study showed that these loss leaders do not have the desired effect on the volume of the overall market. It appeared from this study that the loss leader had a greater effect in reducing the profit margin of the market than it did in generating more sales for the overall store. Using milk sales as an indicator of store traffic, the beef features apparently didn't bring in additional customers. (Table 9 and 10).

The problem of beef is further aggravated by the fact that not all beef carcasses coming to market would be profitable under any circumstances. About a year ago, we made a cutting test on a trim side of beef versus a wasty side of beef. These were from 650 to 750 pound carcasses. At the time we made this cutting test, I obtained prices from a supermarket in the Chicago area. We applied these prices to both sides of beef under three different circumstances.

In the first circumstance, we assumed a round steak sale. The sirloin tip roast, round steak, ground round, rump roast, and boneless stew meat, were the cuts at featured prices. Assigning an operating cost of 11¢ per pound, we found that the trim side of beef made a total net profit of $1.70, while the wasty side of beef lost $7.40. When a chuck roast sale was used, where the English cut roasts, the chuck blade and chuck arm roasts, and the ground beef were on sale, the trim side of beef lost $5.43, while the wasty side of beef lost $12.59. When a steak sale was being held, the trim side of beef made a net profit of $5.60, while the wasty side of beef lost $2.53. It is easy to see that the profitability of these two sides of beef varied greatly depending on the amount of waste. Furthermore, the profitability was also dependent upon the items that were being featured at the time.

This briefly suggests some of the factors which are affecting the prices of beef. I do not believe that it is a hopeless situation. If the producer can furnish more profitable cattle for the retailer to handle, I am sure the retailer will react quite favorably. Perhaps, too, we can educate the retailer to use beef, not as a loss leader, but merchandise it in a manner to generate a profit for his market. The burden of the problem still falls on the shoulders of the producer to produce this type of an animal and then on the educators to educate the retailer toward making better use of it.

This latter area has been one that has only been briefly touched, and I would certainly like to make a plea for increased work at the retail level. We have found this a most rewarding type of extension work. To date, however, the surface has only been scratched, and I think it is necessary for the extension services in our various states to look to this area of education, not only as a direct help to the retail segment of the industry, but indirectly as assistance to the producer himself.

Table 1. TEN TOP ITEMS IN FOOD STORES

	Rank*		
Item	'63	'62	'61
Fresh beef	1	1	1
Provisions**	2	2	2
Fresh vegetables	3	3	3
Beer	4	5	5
Fresh fruits	5	4	4
Cigarettes	6	6	6
Fresh milk	7	7	7
White bread	8	8	8
Fresh poultry	9	9	9
Regular coffee	10	10	10

* Ranked by size of contribution to store volume

** Includes packaged bacon, cured ham and picnics, sausage and sausage products.

Table 2.

GROSS MARGIN AND DIRECT PRODUCT PROFIT
VARY BETWEEN MEAT PRODUCT CATEGORIES

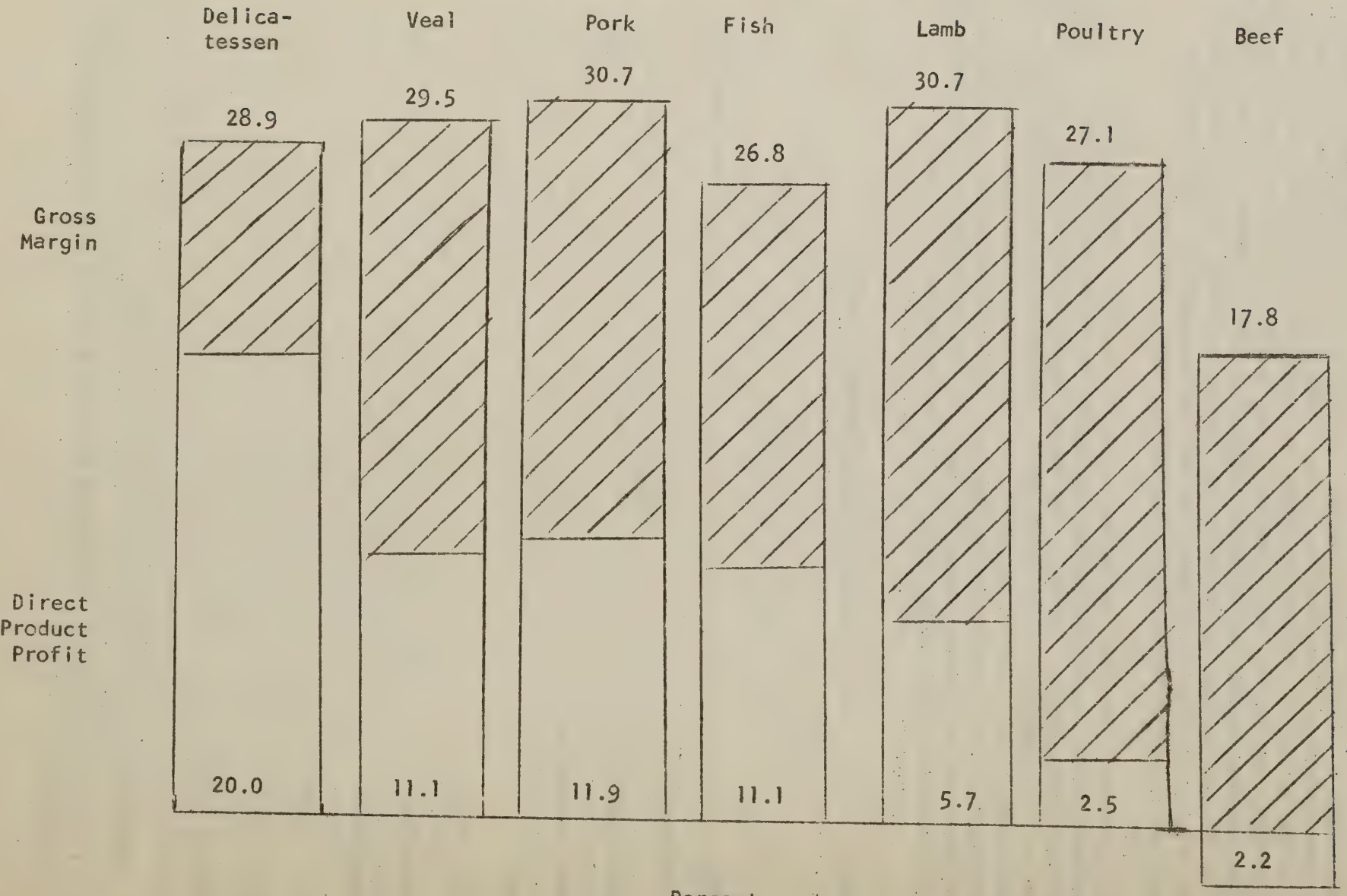


Table 3

MANY MEAT MANAGERS BELIEVE
BEEF TAKES AN INORDINATE
AMOUNT OF LABOR
TO PREPARE FOR RETAIL PACKAGING

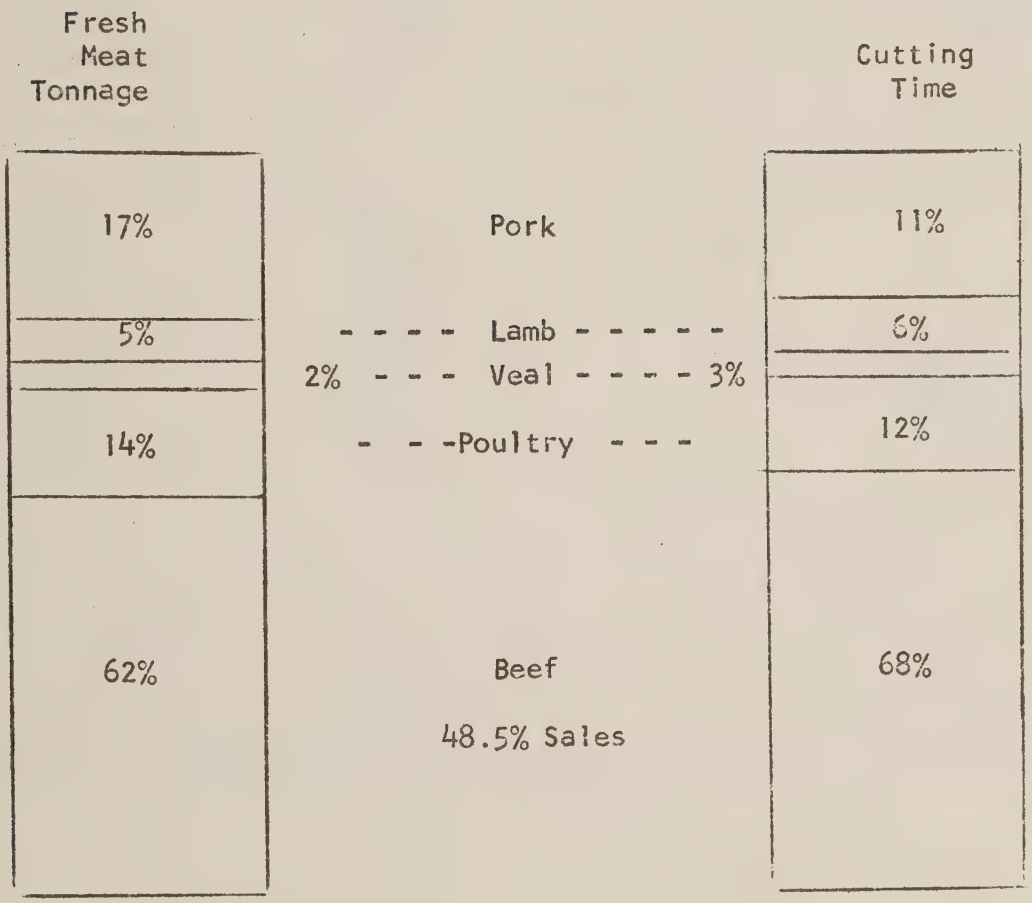


Table 4 TYPICAL SUPER MARKET OPERATING RESULTS

Description of Item	1962	1958
Departmental Sales to Total Sales (Percent)		
Grocery Department	66.60	65.97
Produce Department	8.14	8.19
Meat Department	25.38	25.37
Gross Profit	19.46	18.12
Expense Ratios (Percents)		
Store Labor	7.40	7.04
Advertising	0.95	.85
Promotion	1.82	1.30
Store Supply	0.84	.88
Store Rent and Real Estate	1.46	1.16
Heat, Light and Power	0.66	.55
All Other Expenses	4.77	4.23
Total Expenses	17.71	16.19
Net Operating Profit	1.61	2.20
Store Labor Control Ratios		
Sales Per Man-Hour	$26.95	$22.97
Average Hourly Rate	$ 1.96	$ 1.50

Table 5. Average Proportion of Meat Department EMPLOYEE'S TIME USED FOR VARIOUS ACTIVITIES

Four Retail Meat Departments
Five Weekly Periods, 1963

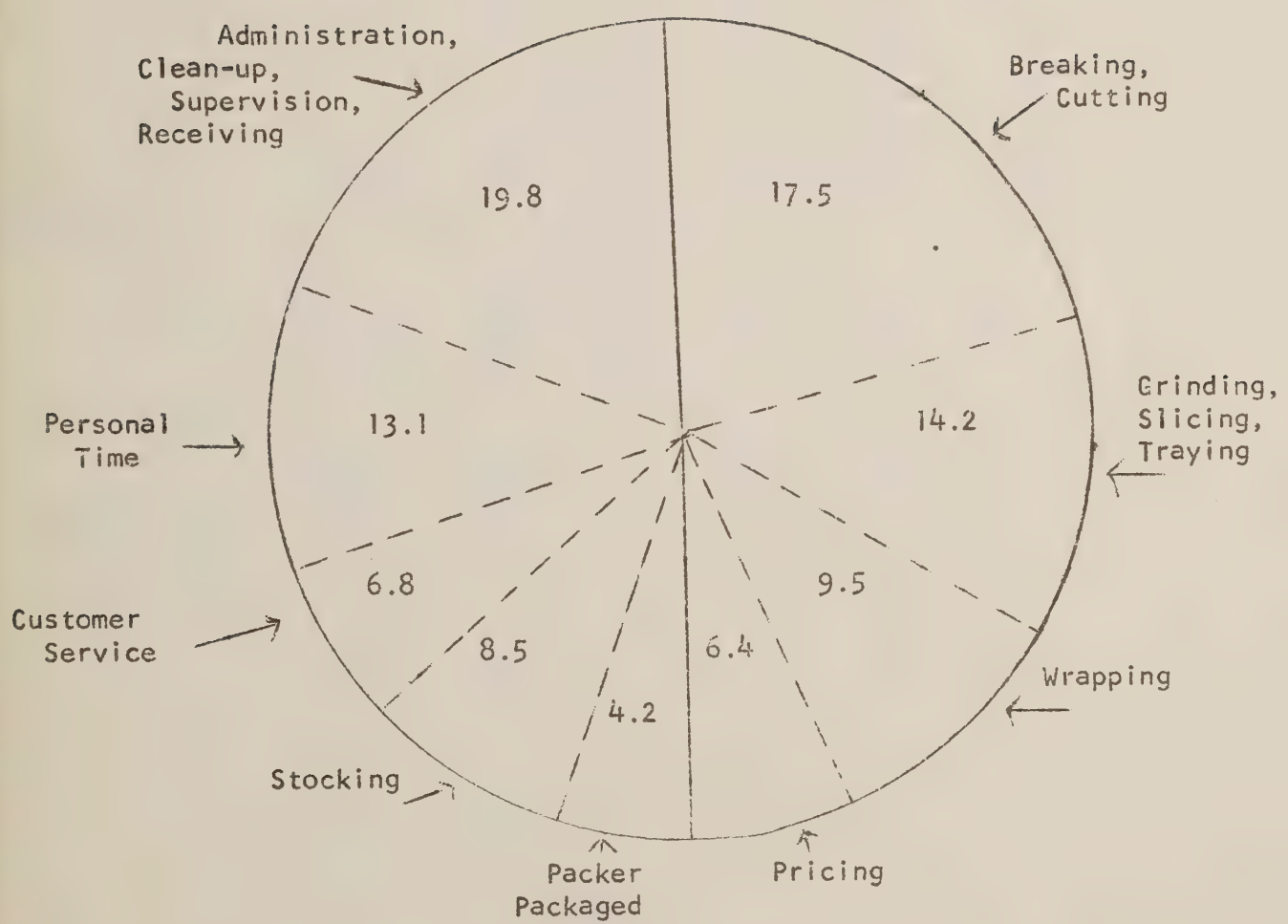


Table 6. CUTTING AND WRAPPING ARE TIME CONSUMING TASKS IN THE MEAT DEPARTMENT

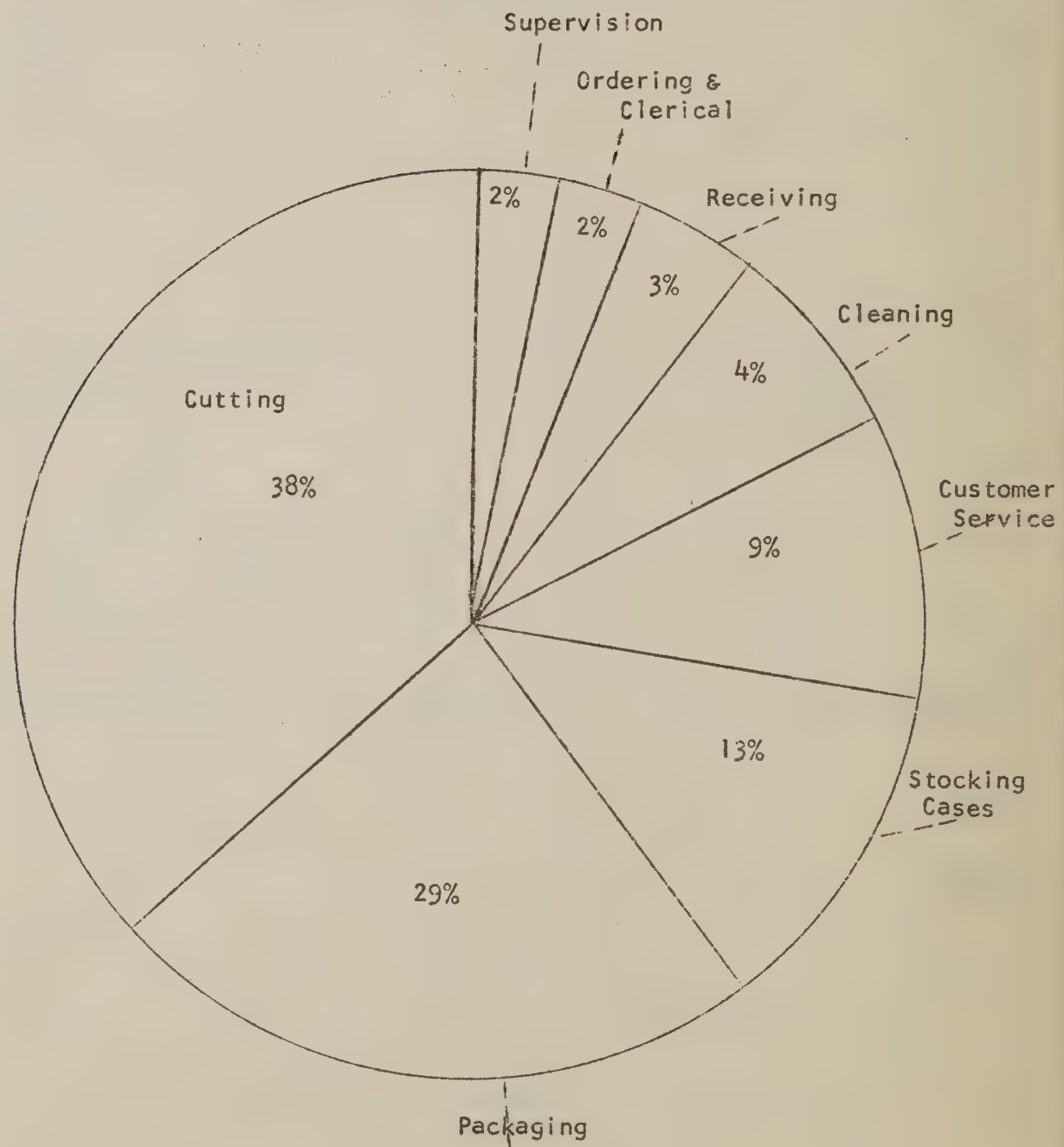


Table 7.

AVERAGE DIRECT PRODUCT PROFITS IN DOLLARS PER POUND
FOR 46 TEST STORES BY MAJOR MEAT CATEGORY

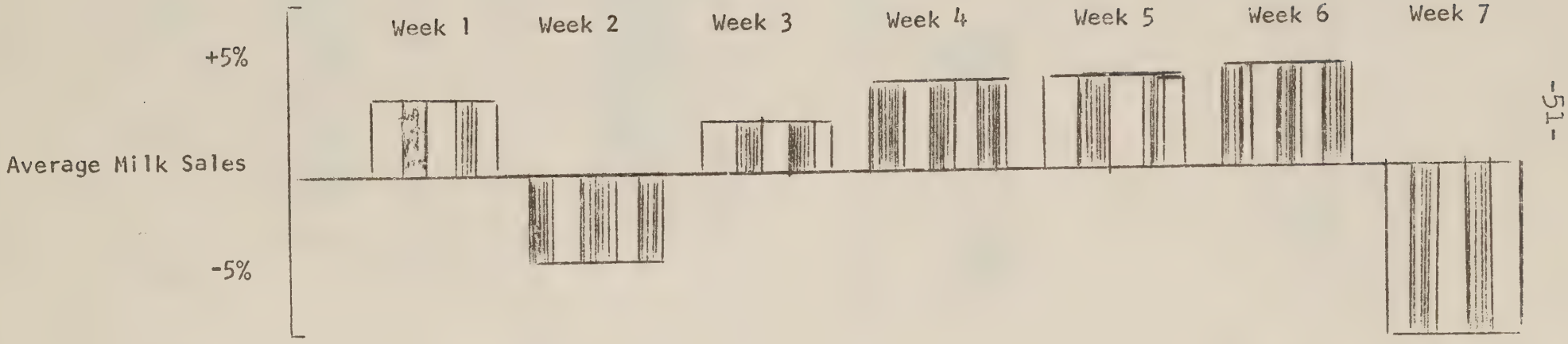
	Deli.	Veal	Pork	Fish	Lamb	Poultry	Beef	Average
Sales	$ .692	$ .746	$ .573	$ .792	$ .594	$ .394	$ .544	$ .563
Cost of Goods	.492	.526	.397	.579	.411	.287	.447	.430
Gross Profit	$ .200	$ .220	$ .176	$ .213	$ .183	$ .107	$ .097	$ .133
Direct Costs	.047	.115	.089	.105	.131	.082	.091	.085
Space Costs	.015	.022	.019	.019	.018	.015	.018	.017
Direct Product Profit	$ .138	$ .083	$ .068	$ .089	$ .034	$ .010	($ .012)	$ .031

Table 8. DIRECT PRODUCT PROFITS IN DOLLARS PER POUND FOR FOUR TEST CHAINS

	Chain A	Chain B	Chain C	Chain D
Sales	$.541	$.523	$.546	$.592
Cost of Goods	.424	.406	.394	.459
Gross Profit	$.117	$.117	$.152	$.133
Meat Dept. Labor	$.049	$.048	$.067	$.051
Check-Out Labor	.014	.010	.013	.011
Wrapping	.006	.006	.009	.007
Stamps	.009	.008	.008	.017
Total Direct Costs	$.078	$.072	$.097	$.086
Rent and Depreciation	$.007	$.008	$.012	$.014
Utilities	.004	.003	.004	.005
Maintenance and Repair	.001	.001	.002	.002
Total Space Costs	$.012	$.012	$.018	$.021
Direct Product Profit	$.027	$.033	$.037	$.026

Table 9.

MILK SALES SHOW NO REACTION TO MEAT FEATURES

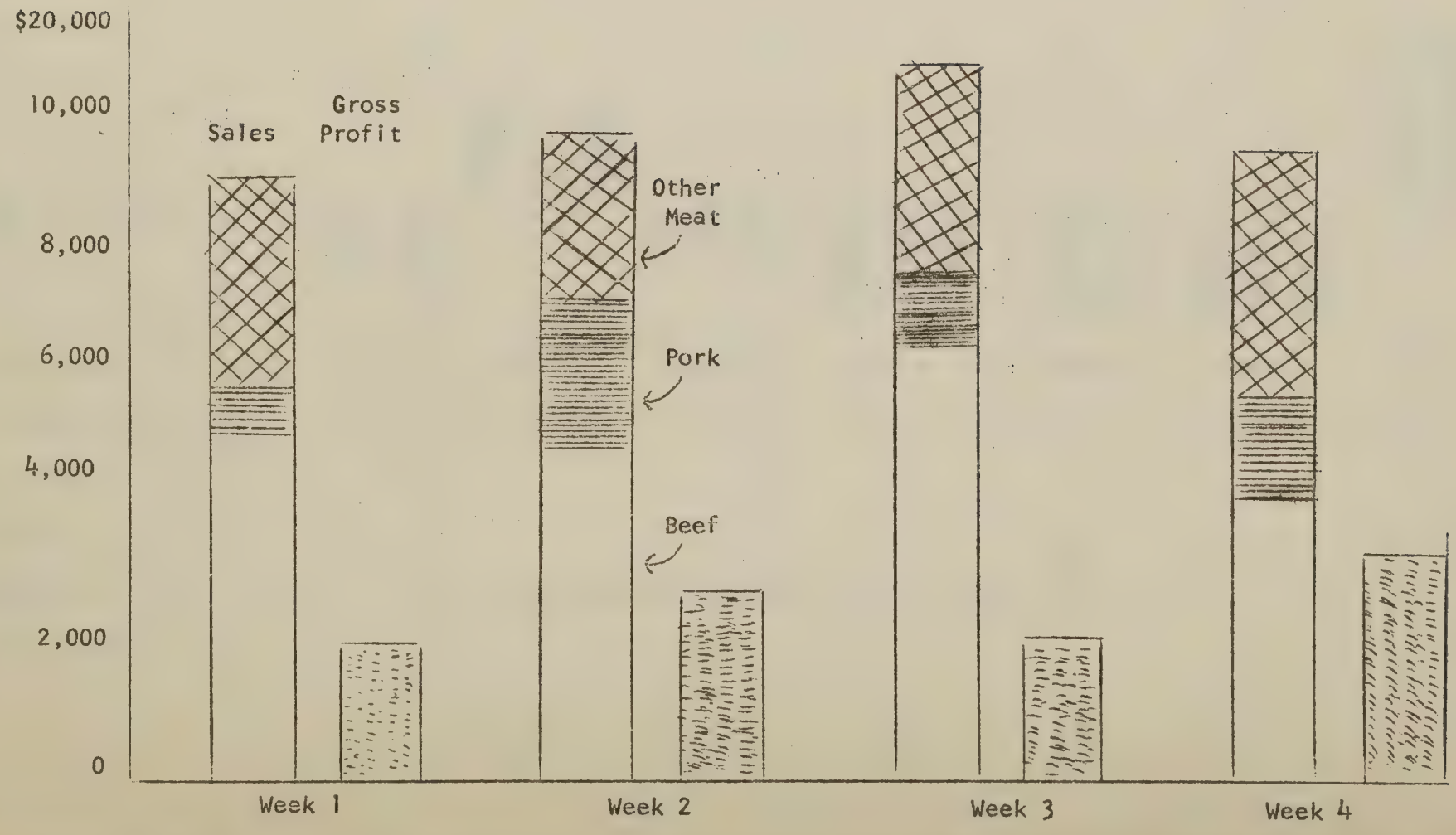


	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Primary Feature	Steak	Chicken	Pot Roast	Chicken	Ham	Steak	Pot Roast
Secondary Feature	Bacon	Pork	Rib Roast	Pork		Bacon	Ground Beef

Table 10.

BEEF FEATURES DEPRESS

DEPARTMENT GROSS MARGIN DOLLARS



REPRODUCTIVE RATE IS A FACTOR IN ECONOMICAL PRODUCTION:

1. Calving Interval Length
2. Percentage Calf Crop

REPRODUCTIVE RATE IS DETERMINED BY:

1. Duration of the Breeding Period
2. Interval Since Calving When Each Cow Enters the Breeding Period
3. The Individual Cow's Length of Interval From Calving to First Heat
4. Conception at Breeding

INTERVAL FROM CALVING TO FIRST HEAT

1. Cows Losing Calves or Not Nursing Them May Return to Heat Sooner After Calving

2. Many Cows Have One or More Quiet Ovulations Before the First Heat

3. Very Poor Feeding May Delay the Return to Heat After Calving

4. Large Atretic Follicles or Even Cystic Ovaries May Develop During the Post Partum Period

NURSED	COWS BRED AT FIRST HEAT		
	SLAUGHTERED AT		CALVED
	3 DAYS	15 DAYS	
	(NUMBERS OF COWS)		
YES	14	14	16
NO	16	16	16

EFFECT OF NURSING AND POST PARTUM INTERVAL LENGTH UPON:

A. Fertilization

B. Embryo Survival

C. Follicular Development

D. Corpus Luteum Development and Progesterone Content

E. Changes in Uterine Glands and Muscle

F. Anterior Pituitary Hormones ---

I. Follicle Stimulating

II. Luteinizing

III. Lactogenic

INSEMINATIONS SOON AFTER CALVING ARE LESS FERTILE THAN LATER INSEMINATIONS

Usual Explanation:

1. Uterus is unable to support another pregnancy until it is completely involuted from the last one.

2. Most uteri have some infection after calving and this destroys the pregnancy.

3. The uterus is particularly susceptible to infection post partum and breeding back early infects the animal and destroys the pregnancy.

4. Breeding back helps incipient infection to get established and thus delays eventual conception.

5. Foregoing explanations may seem "reasonable" but have little basis in fact.

6. Actually we don't even know whether infertility is due to fertilization failure or embryo mortality.

COMPARISON OF THE VARIOUS STATE BEEF CATTLE PERFORMANCE TESTING PROGRAMS 1/

A Review of beef cattle performance testing programs and adjustment factors used in the North Central States, along with U.S.D.A. recommendations.

Adjusted weaning weight: one state adjusts to 190 days, one state 214 days, but most states adjust to 205 days.

Minimum and maximum number of days to which calves are adjusted at weaning: 120 day minimum and 300 day maximum. Most states have a narrower range.

Age of dam adjustments: Two year old dam - some states add 60 or 70 pounds, whereas others use a percentage figure ranging from 1.14 to 1.22. Most states have no adjustment for a 6-year old cow, and some have an adjustment for older cows. Most states that use a percentage use a graduated scale for 2 year olds, and on up to 5 year olds, and from 7 or 8 years on up to 13 year olds.

Sex of calf: Some states adjust to a bull basis and others to a steer equivalent. When adjusting to a steer equivalent an average of about - 5% is used to adjust bull calves and a + 5% for heifer calves.

Grade: At least 8 states use the 17 - 1 system with 17 for the prime plus feeder grade and most of the other states are in the process of changing to this numerical system.

Creep feed: All states take this into consideration and a number of different adjustment factors are used.

Nurse Cow: All states take this into consideration and a number of different adjustment factors are used.

Feedlot test - number of days: Most states use a minimum of 140 days.

Carcass evaluation programs: At least 5 of the 12 states have a program of this type.

1/ Presented by Melvin A. Kirkeide, Associate Extension Animal Husbandman, North Dakota State University, Fargo, North Dakota, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

Official Graders, (Graders selected by members of the Extension Service or by officers or directors of Beef Cattle Improvement Associations): Three or more use official graders.

Use IBM machines for processing data: Seven or more states.

Fees for tabulating data: 10¢ per head and on up.

Beef Cattle Improvement Associations: Five or more states have organized beef cattle improvement associations.

Performance Testing Bulletin: All states have a bulletin or are in the process of having one prepared.

Central Bull Testing Station: Only one or two have this type of station.

Certification: Only two states issue certificates at this time.

A committee with representatives from the American National Cattlemen's Association, Performance Registry International, American Beef Cattle Registry Associations, Cooperative Extension Service and Agricultural Research Service met and reviewed existing beef improvement programs in measuring traits of economic importance in beef production. The committee prepared a statement of recommended procedures.

Following are some of the adjustment factors recommended by the Committee:

Adjusted weaning weight: 205 days

Minimum and maximum number of days to which calves are adjusted: 160 - 250

Age of dam: 2-year olds - 1.15; 3-year olds - 1.10; 4-year olds - 1.05; 11-year olds and up - 1.05

Sex of calf: In case of summaries, etc., where it becomes necessary to adjust for sex the following is recommended:
Bulls, minus 5% and Heifers, plus 5%
The committee recommendation is that whenever possible the weights should be reported on the basis of each sex without sex adjustment.

Grade: Use numerical grades of 17 - 1

Feedlot test period: 140 to 150 days minimum

It is believed the recommendations of the committee will be very helpful in obtaining more uniform adjustment factors between states.

At present there is some difference in adjustment factors used in the different states; however, in most cases the difference is not great and with the United States Beef Cattle Records Committee statement of recommended procedures available, it will help make the adjustment factors more uniform in the various states.

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BREED ORGANIZATION IMPROVEMENT PROGRAMS FOR CARCASS TRAITS 1/

In order to attain the optimum and most rapid improvement in the cattle population, some means of accurately identifying differences in carcass traits and body compositon of the live animal must be available. If and when this becomes a reality, mass selection for heritable and economically important carcass traits could be effectively practiced on both parents. It appears unlikely in the immediate future that a simple, yet rapid and precise method will be developed which identifies the muscle-fat ratio as well as the meat quality differences in live cattle. Because of these limitations of identifying differences in the live animal, the progeny test appears as one useful tool available today for identifying carcass superiority in beef sires.

While this article is confined to the carcass and meat aspects of beef production, it should be pointed out that of even greater importance to efficient production is the influence of reproduction, growth and efficiency of growth.

Cattle breeders, those persons dedicated to the advancement of the beef industry and/or to a particular breed of cattle, find themselves under two and sometimes opposing forces, namely, that of producing the kind of cattle which best meet the needs of the industry versus the cattle which show the most immediate profit regardless of their influence on the future of the industry. This discrepancy can result from numerous sources, including an unrealistic market for slaughter cattle which fails to reflect true value differences in composition of weight and/or quality.

One of the major responsibilities of any organization dedicated to the improvement of beef cattle should be to identify practical cattle which are superior in growth from birth to slaughter in addition to producing a desirable meat product. It would seem to the future advantage of the beef industry and specifically to any breed that certain traits, whose economic values are not fully recognized by today's market, be incorporated into our cattle selection programs, especially should they be made a part of those programs intended to have a long lasting effect. The acceptance of such programs, on the part of breeders, however, would be greatly enhanced whenever the present system of merchandising live cattle and carcass beef on a weight and grade basis is changed to one which more nearly reflects true carcass composition, quality, and value.

1/ Presented by V. H. Brungardt, Professor, Department of Meat and Animal Science, University of Wisconsin, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

In order to make improvement in carcass traits, it is essential that differences for these traits exist among cattle. Secondly, in order to take advantage of these differences it must be determined what portion of this variation is heritable and what portion of the total variation can be obtained by nutritional or environmental treatment. It is a well-established fact that cattle of comparable weight, feeding regime, etc., vary in their muscle to fat ratio and other components of live weight. Numerous research stations have reported moderate to moderately high estimates of heritability for the major components of carcass composition and feedlot gain. These indicate the potential improvement for carcass traits and growth, if proper selection and mating systems are practiced. From present knowledge of the variation in carcass merit and growth and the heritability of these two traits, it seems logical that improvement in performance can be made within the present breeds of beef cattle.

While we all recognize the need and urgency of identifying breeding cattle which are superior in their meat properties, it is well to point out at the outset that for the majority of purebred and commercial breeders it is only practical to make selection for traits which are recognized today or in the forseeable future in the marketing of breeding and slaughter cattle. This, with all of its built-in advantages and disadvantages, is through necessity the procedure which most must use to guide their selection programs. However, it is well to remember that buying methods at the market place of slaughter cattle can change rapidly and almost instantaneously whereas changes in herds come slowly and require several years to bring about any measurable change. Thus it is important to the <u>future</u> of a breed and the industry that these changes be anticipated in advance and the proper foundation laid for their orderly implementation. Too many times our buying practices of slaughter cattle appear not to have conformed entirely to the most efficient methods of beef production. This apparent discrepancy, which has been the subject of frequent discussion, is in urgent need of attention by the buyers and purveyors of meat and meat products.

Breed organizations have in effect programs designed to assist commercial and purebred breeders in obtaining a more complete analysis of the breeding potential of their sires and/or establish the level of herd performance. The main objectives of these programs are to identify, within a herd, those cattle which make the most rapid and efficient weight gains to common market weight, and, secondly, to identify differences in muscling, carcass cutability and meat quality which reflect value and superior development in the round and other preferred areas of the carcass.

In any record of performance program designed to test or measure carcass value it becomes imperative that pre-slaughter growth and/or age be recorded to permit realistic interpretation of the carcass data. Should only carcass data be obtained, without any knowledge of prior performance or without any control over feeding

practices, then it would seem that but little if any good could result from the application of this information to selection programs. Furthermore, it would seem desirable that evaluation of carcass records be based upon a measurement of salable meat produced per day of age within a predetermined minimum quality level. This could well be the desired way of expressing animal size along with weight at 365 days of age.

The purpose of any carcass program should be to measure differences in three basic essentials of production. These are as follows:

1. Growth - or Carcass Wt. (from birth to slaughter) -- a continuous measure of growth is preferred over feedlot gain since some of the pre-test feedlot environmental influences can be minimized. A measurement of growth is of additional value since superiority in carcass muscle and quality must, for reasons of practicality, be identified within cattle that possess optimum growth potential. Greater emphasis should be placed on growth to 365 days of age or some similar period and less concern could be made of mature weight unless mature weight is found to be associated with increased efficiency of production, more satisfactory reproduction or longivity.

2. Retail Meat Yield - Generally defined as the yield in salable product from the chuck, rib, loin and round should be one of the three major categories measured. Numerous methods of obtaining this value are available. Rib-eye area and the cover of fat per cwt. of carcass could be obtained as additional measurements of the muscle and fat ratio.

The relative value of various carcass traits in estimating quantitative meat yields is one question frequently posed by producers. The importance or influence of various carcass traits upon retail yield can be demonstrated by the following:

Table 3. To obtain an Increase in Retail Yield of 1% (from 49-50%) is associated approximately with:

1. An increase in rib-eye of. . . . . .2½ to 3 sq. in.
   or
2. An increase in trimmed round of. . . . . 0.60 to 0.70%
   or
3. A decrease in fat (single meas.) of. . . .15 to .20 in.
   or
4. A decrease in carcass weight of. . . . . .70 to 80 lbs.
   or
5. A decrease in kidney knob of . . . . . 2.0 to 2.5 lbs.

3. Meat Quality - This trait being a very evasive yet extremely important subject should probably be measured as presently defined in the USDA grading system. Since these standards

are routinely used in our grading system they have economical value to producers. It is well appreciated that these standards are not totally accurate and reliable as indicators of meat quality. Realizing that these standards may change and result in a profound influence on the ranking of sires for meat quality, it is recommended that tenderness evaluation be made when possible on each progeny group as an additional measurement of quality. As other quality measurements become identified and more objective in their determination these should then be added to the list of quality measurements. The relative importance of quality vs. quantity is a function of economic conditions. Since it appears that long range economic conditions cannot be predicted with any degree of accuracy the future importance of meat quality to beef cannot be precisely surmised.

The progeny test appears to be one of the best methods available today to detect sire differences in carcass performance, certain limitations of this method should be noted. First, the rate of improvement through progeny tests is estimated to be only about $\frac{1}{4}$ that of direct selection upon the sire and dam. The number of sires that can be evaluated adequately places another limitation upon the effectiveness of this method. A second method to improving carcass traits and especially lean-fat ratio would be by subjective evaluation. Scoring and evaluation live cattle for muscle can be expected to bring about some improvement in this trait. When utilizing the progeny test several criteria should be recognized.

I. Procedure in Progeny Test:

1. Two or more sire test - to permit within herd selection between sires two or more sires should be tested simultaneously and under like conditions. If only one sire can be tested the test becomes a herd test rather than a sire test.

2. Random Sample - A random sample of a sire's progeny should be obtained for measuring growth and carcass data. If a select group of calves are used then the test becomes biased and of little value in comparing the performance of the sires from the same herd.

3. Minimum Progeny Numbers - Generally eight steers, heifers or any combination of the two, comprise the minimum number per sire group. Requiring larger numbers per sire rapidly reduces the number of sires that can be studied and greatly increases the chance of overlooking an outstanding sire. The added accuracy of the information resulting from the use of 10 or more animals is generally limited providing the sampling and mating procedures have been made randomly. At this stage of identifying sire difference for carcass traits it becomes

important to test as many sires as feasible in the interest of not overlooking some really outstanding sire.

II. Methods of obtaining test calves.

1. Purebred calves - because of the demand for breeding stock and the resulting loss in economic value, purebred calves seldom can be expected to furnish a random sample of a sire's performance. However, if the top 10-25% for conformation and weaning weight were removed, the remainder of the calves could then be used logically to furnish test cattle for measuring sire differences. This is true if similar procedures were followed on all sires studied within a herd. A herd test, which is a useful and meaningful test for purebred herds, can be obtained from a single sire herd. In practice, this gives some measure of the potential of a herd to produce superior carcasses.

2. Calves from Commercial Cow Herds - The most likely source of test calves will result from mating purebred sires to commercial cow herds. These matings can be made in some instances without any great financial loss to the breeder. As indicated earlier, this affords an excellent opportunity to test several sires simultaneously and also to obtain random samples for test purposes. The cost of obtaining these calves or the loss which results from the use of purebred calves will influence the extent to which individual breeders can participate in the progeny test. The value of this data can be measurable especially if the general concern of today about beef carcass superiority becomes reality in the next few years.

III. Evaluation and Interpretation of Progeny Data:

1. Certification and Standards - In actual practice, most if not all, progeny test conditions do not lend themselves to certification programs. Because of the variation in climate, management and nutrition practices realistic standards which are applied across a wide range of conditions should preferably not be made. Therefore, unless the comparison is made between individuals originating from the same cow herd and are receiving like treatment, it would seem advisable that fixed standards not be established nor certain levels of performance be required for certification of sires.

It could be stated and certainly is probable that some cow herds because of their high level of productive performance and/or some feedlots ideal environment under which progeny test calves are maintained could play a

major role in certifying a sire; whereas some other cow herds because of their poor performance potential or the management and environment of the test calves could not certify any sire.

Observations made from the data accumulated on approximately 1000 test cattle fed from weaning to slaughter weights would tend to indicate large variation between feedlots for numerous traits of importance to carcass evaluation programs.

Certification, on the other hand, does stimulate and initiate the desire to reach a certain objective and as such does offer usefulness.

Goals or the fixing of certain minimum requirements for each trait could well be the responsibility of each breed. It would seem desirable that this approach be used to assure breed identity and to foster selection for traits of specific interest to each individual breed.

At present it would seem most advisable that a breeder compare each sire's progeny against his herd average for the particular test under consideration. Additionally, a breeder may use with some caution the feedlot average of all cattle under test with his own. The latter may furnish him the best and most realistic comparison available today outside his own herd average.

2. Goals or Guidelines are essential for evaluating a breeder's data but should be based upon the upper level of production within herd test mates for each trait considered. Thus, the goal for any carcass trait, for example--retail yield--becomes the level of performance of the upper 20-30% of the test mates. If standards of 2.4 lbs. of gain had been established in a particular test with which I am associated, then nearly all cattle in one feedlot would be certified for gain, whereas less than 5% of all cattle met this same standard in another feedlot. These differences in results cannot be contributed to genetic differences because of possible and probable variations between test lots.

Table 1 contains for steers the estimated range, averages and goals for numerous traits of major importance to the beef industry. Based upon our present knowledge the estimated goals seem to be a reasonable level of productivity and are offered only as a possible aid to establish in the minds of breeders some numerical value representative of each trait.

Table 1. Suggested Goals or Guidelines for 1000 lb. steers full-fed from weaning to slaughter.

	Estimated Range	Estimated Average	Estimated Goal
Wt./day of age, lbs.	2.0 - 3.0	2.1	2.2 - 2.8
Retail yield*,%	45 - 53	49.5	50 - 54
Ret. meat/day of age,lbs.	.50 - 1.0	.65	0.75 - 0.90
Rib-eye area, sq. in.	9.0 -15.0	10.7	12.0 - 13.5
Trimmed round, %	19.0 -24.0	21.8	22 - 25
Fat(12th rib-sing.meas.),in.	.30-1.25	.70	.40 - .60
Meat Quality	G⁻ to P⁻	G⁻	* *

* Retailable meat from the chuck, rib, loin and round expressed as a % of carcass weight.

* * Minimum quality commensurate with purchasing habits of consumers and efficiency of production.

The data presented in Table 2 for heifers is based upon limited numbers and should be used with this in mind.

Table 2. Suggested Goals or Guidelines for 850 lb. heifers full-fed from weaning to slaughter.

	Estimated Range	Estimated Average	Probable Goal
Wt./day of age, lbs.	1.5 - 2.5	2.0	2.1 - 2.4
Rib-eye area, sq. in.	7.8 -13.0	10.0	10.5 -12.5
Trimmed round, %	19.0 -24.0	21.8	22.0 -24.0
Fat(12th rib-sing.meas.)in.	.30-1.25	.65	.40- .50
Meat Quality	G⁻ to P⁻	C-	*

* Minimum quality commensurate with purchasing habits of consumers and efficiency of production.

The probable goals contain a range in values since they are given with an awareness of the role of management and environment upon the expression of these traits.

The future of any breed depends, as it always has, upon the ability of today's breeders to meet the needs of tomorrow's beef industry. The Performance Records Programs can be the stabilizing influence which can guide the breed into a practical, efficient and prosperous future. If the beef industry is in need of a modification in model, it seems logically the responsibility of the purebred industry to develop the mold -- otherwise, the purpose and need of a purebred industry is no longer in evidence. We have every reason to believe that purebred breeds will continue to supply proven seed stock for today's needs, just as they supplied breeding stock in past years, superior to any other source at that particular period of time.

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GENETIC IMPROVEMENT POTENTIAL OF ECONOMICALLY IMPORTANT TRAITS THROUGH BEEF CATTLE BREEDING PROGRAMS 1/

Genetic progress which can be made with a mass selection system in beef cattle depends upon (1) the heritability of the traits being considered, (2) their genetic relationships, (3) the number of traits being considered in selection, (4) the intensity of selection which can be practiced, and (5) the reproductive rate.

Using approximate average heritability estimates developed thus far from research, together with estimates of usual variation and reproductive rate, it is possible to estimate genetic progress. Several people have done this based on slightly different assumed heritabilities and selection intensities. The writer has made some estimates which are discussed in more detail in the publications listed at the end of this article. They will serve as illustrations here.

In these estimates, the formulas developed by Dickerson and Hazel (1944) were used and extended where necessary to estimate progress attainable for a few traits and a few selection systems. The estimates apply to large populations where only one character is being selected for at a time. The selection plans are: (80% calf crop and 50% sex ratio assumed)

I. For Cows: (cows calve first at 3 years and 5% annual attrition assumed)
60 percent of all heifer calves retained for breeding with 50 percent of these culled on calf performance after two calf crops. Remainder used to 10 years of age.

II. For Bulls: (30 percent annual attrition assumed for bulls over 3 years of age)

Plan A. 5 percent of all bulls saved, used in natural service at ages of two and three, then discarded.

Plan C. 5.6 percent of all bulls saved and bred to 20 cows each as yearlings. The top 20 percent on basis of individual and progeny information returned to service as four-year-olds and survivors used naturally to 9 years of age.

Plan D. .04 of one percent of bulls saved and used artificially without culling, starting at 2 years, on 2500 cows each per year to 9 years of age.

1/ Presented by E. J. Warwick, U.S.D.A., Animal Husbandry Research Division, Beltsville, Maryland, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

Plan E. .5 of one percent of bulls saved and bred artificially as yearlings to 40 cows each. The top 6½ percent of these on basis of individual and progeny information returned to service as four-year-olds and bred artificially to 2500 cows per year to 9 years of age.

Plan F. .01 of one percent of bulls saved and bred artificially to 10,000 cows each per year starting as two-year-olds and used to 9 years of age.

Plan G. .5 of one percent of bulls saved and bred artificially as yearlings to 40 cows each. The top 2 percent of these on basis of individual and progeny information returned to service as four-year-olds and bred artificially to 10,000 cows per year to 9 years of age.

The foregoing plans are not necessarily the most efficient which could be devised nor would some of them necessarily be desirable or economically feasible from an industry-wide standpoint. They do, however, represent widely divergent plans which will serve to illustrate opportunities for progress through breeding.

Bull plans A and C represent what might be accomplished under natural service with relatively simple plans of mass selection alone or mass selection combined with progeny testing. Bull plans D, E, F, and G represent potentials with artificial insemination used with and without progeny testing.

Estimates of progress which might be possible in a ten year period are given in Table 1. These are unrealistic for two reasons: (1) they assume complete performance records on all animals for all performance traits and for slaughter information on a random sample of each sib group, and (2) single trait selection would rarely be feasible.

The estimates do, however, show general possibilities and illustrate the fact that progress will be slower (in relation to size of standard deviation) for slaughter traits than for those which can be measured in the live animal.

If selection is for several genetically independent traits, then progress for any one should equal $1/\sqrt{n}$ of what would be possible if selection were solely for it. Thus, the estimates can easily be extended to what might be possible if various items were combined in selection programs.

TABLE 1. ESTIMATES OF GENETIC IMPROVEMENT POSSIBLE IN A 10-YEAR PERIOD IN LARGE BEEF HERDS UNDER A FEW POSSIBLE BREEDING SYSTEMS WHEN SELECTION IS FOR ONE TRAIT ONLY.

	Weaning Weight[1]	Postweaning Feedlot Gain[2]	Efficiency of Postweaning Gain[3]	Area of Rib Eye[4]	Tenderness[5]
Bull Plan A (Natural Service)	43.0 lb.	0.43 lb.day	-84.0 lb.	0.29 sq.inch	-0.88 lb.
Bull Plan C (Natural Service)	48.0 lb.	0.47 lb.day	-92.4 lb.	0.40 sq.inch	-1.20 lb.
Bull Plan D (Art. Insem.)	59.0 lb.	0.60 lb.day	-118.2 lb.	0.34 sq.inch	-1.12 lb.
Bull Plan E (Art. Insem.)	65.0 lb.	0.59 lb.day	-118.2 lb.	0.65 sq. inch	-1.95 lb.
Bull Plan F (Art. Insem.)	63.0 lb.	0.65 lb.day	-126.6 lb.	--	--
Bull Plan G (Art. Insem.)	88.0 lb.	0.69 lb.day	-132.6 lb.	0.74 sq.inch	-2.22 lb.

1/ Assumed heritability of 30 percent; standard deviation of 40 lb.

2/ Assumed heritability of 45 percent; standard deviation of .3 lb. for males and .25 for females; gain expressed in terms of average daily gain.

3/ Assumed heritability of 40 percent; standard deviation of 60 lb. Efficiency expressed as pounds of TDN consumed per 100 lb. gain. Improvement in feed efficiency is denoted by reduction in feed required.

4/ Assumed heritability of 50 percent; standard deviation of 1.0 square inch. Selection based entirely on information from sibs and progeny.

5/ Assumed heritability of 50 percent; standard deviation of 3.0 lb.; expressed in pounds of force required to shear a one inch core on the Warner-Bratzler shear. Selection based entirely on information from sibs and progeny. Improvement in tenderness is denoted by reduction in pounds of force required.

Genetic correlations among traits can either enhance or hinder progress for a given trait when selection is for two or more traits depending on whether correlations are positive or negative. Sufficient data are not available to give us precise estimates of genetic correlations in beef cattle but the following summarizes my concept of present knowledge:

1. Rate and efficiency of gain are highly correlated genetically. Each $\frac{1}{4}$ pound increase in daily gain probably results in a feed saving of about 7 percent per unit of gain.

2. Rate of gain at different life stages is positively correlated but not highly enough that gain in one stage can accurately predict gain in another.

3. Growing ability and conformation are related to only a low degree.

4. Genetic relations between production and carcass characters are low. There is likely a negative correlation between growth and ability to marble at a given weight, but it is apparently rather low.

5. Relationships of maternal traits to growth and carcass characters are not well understood.

Critical selection experiments are not far enough along to draw sweeping conclusions. However, from information now available, it is probable that beef cattle can be changed fairly rapidly by selection for growth and efficiency. Rapid change for carcass characters should also be possible if potential carcass characters can be effectively estimated in live animals. Progress in improving fertility and/or liveability through selection is likely to be very slow.

References

1. Dickerson, G. E., L. N. Hazel. Effectiveness of selection on progeny performance as a supplement to earlier culling in livestock. J. Agr. Research 69(12): 459-476. Dec. 15, 1944.

2. Warwick, E. J. Genetic aspects of production efficiency in beef cattle. Nat'l. Acad. of Sciences, Nat'l. Research Council Publ. 751. 1960.

3. Warwick, E. J. Breeding beef cattle for improved productivity and market desirability. CAEA Report 15, "The Future for Beef," 1963.

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PRACTICAL SLAUGHTER CATTLE FINISHING PROGRAMS 1/

A practical cattle feeding program is one which you or a cattle feeder can expect to be profitable over an extended period of time. Slight modifications will need to be made from time to time to meet existing or changing conditions. In Nebraska many different systems or combinations fit my evaluation of a practical finishing program.

Because my remarks will be based on an evaluation of Nebraska's beef feeding industry, following is some basic information about it:

1. 2.4 million cattle were fed for slaughter in 1964.

2. Our feeding industry has increased from .8 million cattle fed for slaughter in 1950 (the first year for these estimates in Nebraska) to 1.1 million in 1956, 1.4 million in 1959, and 1.8 million in 1962.

3. Many of our cattle are fed to too heavy weights.

4. Our feeders were financially burdened by slaughter cattle prices in 1963 and 1964. However, most have been able to obtain credit for the 1965 feeding year. In fact, we have more cattle on feed than ever so far in 1965.

5. Nebraska now feeds more cattle than are born and raised in the state (including dairy calves).

6. We now feed approximately 55-60% of our feed grain produced and see no reason why nearly all should not be fed to livestock in Nebraska.

7. Feeding this volume of cattle has resulted in substantial increase in size of feedlots. Table I shows the number of feedlots of various capacities as determined by a recent survey made by our Agricultural Statistics Division. This survey did not evaluate total number fed per year, but only the capacity for cattle at any given time.

1/ Presented by Paul Q. Guyer, Extension Livestock Specialist, University of Nebraska, Lincoln, Nebraska, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

Table I Sizes* Of Feed Lots In Nebraska
January, 1965

5000 up	39
2000 - 5000	76
1500 - 2000	54
1000 - 1500	153
800 - 1000	69
600 - 800	114
500 - 600	346
Total 500 up	851
Total Feeders	23,000

*Capacity at any one time.

The successful feedlot operator or farmer feeder must develop many managerial skills. He must become to some degree a specialist in nutrition and feeding, livestock evaluation, livestock procurement and marketing, disease control and parasite control which are related to our specific specialities. Also, he must be very knowledgeable in credit and financing, bookkeeping, evaluating outlook information and statistics, and personnel management. He needs to be an agronomist, economist, entomologist, nutritionist, engineer and many others to get the job done. His needs are much broader than our subject matter area.

In planning practical programs from the standpoint of our subject area the following points need primary consideration.

1. Weight and grade of carcass beef in demand. A finishing program cannot be practical unless weights and grades of beef in demand have been duly considered. Some highly finished and heavy hotel and restaurant type cattle will be needed, but the bulk of the demand the last few years has been for cattle with less finish, yet excellent flavor, tenderness and juiciness. Our feeders, as they increased their size of operations, were slow to recognize these changes in demand. Perhaps more important to them, they were also slow to recognize the effect of holding cattle too long and making them too fat on cost of gain and net profits. The recent depression in cattle prices brought this lesson home to our feeders and I trust their memory is not short.

   In evaluating the cost of production of finished slaughter cattle it seems to me that we must look beyond the feeder to the commercial producer and purebred breeder. We should study cost of production from the time the cow is bred until the steer is finished for slaughter in relation to the most economical weight or weights for marketing slaughter cattle.

2. Size and type of feeding operation. One way of classifying feeding operations is shown in Table II.

Finishing programs do and should vary with different sizes and types of feeding operations and with location of these operations.

Near Omaha several feeding operations are based on the opportunities which result from being close to the market. In these lots, heavy cattle (many are plain also) are fed for short periods on a high concentrate ration. Roughage is used in small amounts primarily because they are not located close to a supply,and the cost is high by the time it gets into the feed bunk.

Table II. Break Down of Nebraska Feed Lots By Size and Type of Feeding Operation

Commercial
- Large - 5000 up
- Small - 2-5000

Farmer Feeder
- Large - 500 up
- Small - Less than 500

Farmer Grower

Our largest lot, in terms of numbers fed, has found that they can be more competitive feeding an all barley ration than by using locally produced grains or roughages. At the other extreme is the farmer feeder or the farmer grower who has substantial amounts of roughage that can be utilized efficiently through beef cattle. In the smaller farm feeding operations young lightweight cattle are often fed on high roughage rations in the growing phase and substantial amounts of roughage in the finishing phases. In many cases the total farm operation of the farmer feeder is oriented around the beef producing enterprise. The farmer grower usually uses young light-weight cattle to salvage corn stalks and other roughage of low market value. When the cattle weigh 600 - 750 lbs. they are sold for feeders.

3. Kind of cattle to feed. We have all varieties of cattle fed for slaughter including cattle from Canada and Mexico, Holsteins and fancy or prime feeders, calves and 3-year-olds. All can be profitable if enough factors are evaluated in determining their purchase price.

Many of our feeders are developing sounder operations by recognizing that feeder grade as we have evaluated it in the

past has little relationship to efficiency of gain or is not highly correlated with slaughter price when sold. Yet, when we look at the total industry it would appear that there is no reason not to strive for production of cattle with conformation of at least choice feeder grade.

We feed many heifers in Nebraska. If these are purchased realizing that they make slower and more expensive gains and normally bring less as slaughter animals, they can be as profitable investment as steers. We are finding a limited amount of bulls being fed to probe for a market. Young fat bulls will be accepted by the market within a few years, in my opinion, and then bull feeding will increase.

Cattle are now started on feed at younger ages than a few years ago. A continuation of this trend will surely occur. As we produce calves with heavier weaning weights and more growth potential, we will find many of these being fed on high grain finishing rations from weaning to market weight. In fact, we have some feeders who have been feeding Charolais-cross calves for rapid gains from weaning to market for several years.

As indicated earlier we feed many kinds of cattle. Some of our producers are developing a preference for crossbreds. Research work at Fort Robinson would appear to justify a slight preference to British crossbreds over straight British beef breeds. Brahman crossbreds appear to be desirable for summer feeding in most of our feedlots.

4. Feeds Available - Most feeds available in Nebraska are produced with feed value as a secondary factor in their production. Adaptation of crops to temperature, moisture, topography are of primary importance in determining our feed supply. In addition we have, in our beet growing areas, a sizable amount of beet pulp and beet tops available from sugar beet production. Many of the feeds available are listed in Table III.

Table III Feeds Available

Concentrates	Roughages
Corn	Silages
Milo	Corn & Sorghum
Wheat	Beet Top
Beet Pulp	Small Grain
Molasses	Alfalfa
Cane, Beet, Corn	Hay
Barley	Haylage
Rye	Silage
Oats	Dehydrated
	Corn Cobs
Safflower	Pasture

All feeds in Table III are acceptable cattle feeds and for the most part must be used as livestock feed (except for wheat) if they are to make the maximum return to Nebraska's agriculture.

The farmer feeder has an opportunity to orient his production around his feeding operation. This contributes to increasing efficiency of his total operation. Generally the farmer feeder and particularly the smaller farmer feeder finds it practical to feed larger amounts of roughage than the commercial operator. Many are finding that use of high moisture corn and haylage can reduce costs of production. The feeder can take advantage of the fact that harvesting corn or sorghum as silage will increase the pounds of beef produced per acre. If feed grains continue to increase in price these feeders will find their operations becoming even more competitive because high roughage rations will then produce lower cost gains compared to high grain rations.

Our beef feeding industry must become more competitive than it has been during the past few years if it is to grow and prosper as it should. Three important areas that need more attention are:

1. Record Keeping - Most of our farmer feeders do not keep accurate records of daily feed intake, periodic weights of cattle, carcass data, or equipment and labor costs. When these records are kept the feeder can and does figure with a sharper pencil in planning his entire feeding program.

2. Feed Analysis - Corn and sorghum, the major feed grains produced in Nebraska, are quite variable in protein content; consequently feeders have variable results when using average analyses for formulating rations. The tendency has been to over-feed protein as an insurance factor. Feed grain analyses reduce or eliminate the need for overfortification with protein and result in a reduction in cost of gain whether grain happens to be average or above in protein content. Before protein analysis can be used most effectively a quick and economical test for protein needs to be developed. When it is, feed grains may be sold on the basis of their protein content.

3. Carcass Evaluation - A summary of carcass data should be made on every lot of cattle sold for slaughter. Carcass information and an understanding of it will cause most feeders to get away from overfeeding rather quickly. In addition, these data are necessary to make a complete evaluation of a lot of cattle. In the Lexington area where feeders own and operate the Cornland Dressed Beef Plant, the owners and others who follow their cattle through the plant have changed their feeding programs substantially. As a result some have shortened the feeding period for 700 to 800 lbs. feeder cattle to 120 days and yet get 75 to 85% to grade choice.

Many other factors are, of course, important in developing practical fattening programs. In the area of research I feel that research in environmental control is very important. As we refine our feeding programs we will undoubtedly become more interested in net energy of feeds (particularly for plant breeding.) Also, we will probably see some use of linear programming, particularly by large feedlots that must purchase most or all of their feed.

To summarize:

1. Many combinations of cattle, feed and lengths of feeding periods are involved in practical and profitable feeding operations in Nebraska.

2. As in many other feeding states our feeders are finding it practical to feed younger cattle to higher slaughter weights and less finish than they have in the past.

3. Size of operation, location and special skills of the operator influence the type of operation followed in any one lot.

4. To be more competitive in the future our feeders need to keep better records, use grain analyses in balancing rations, and obtain carcass data for evaluating their feeding program. They, of course, need results of research in many areas of which environmental research appears to be of major importance for our area.

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DRY-LOT MAINTENANCE OF BEEF CATTLE BREEDING HERDS 1/

Population growth and other economic forces (i.e., increased consumption of beef per capita, and export demand) may have the effect of making it profitable to increase production of feeder cattle in the CORN BELT.

Increases in beef cow numbers in the Corn Belt may well be accompanied by programs of dry-lot maintenance. Considerations are:

1. Total land value investment per unit of production. Can the Corn Belt producer compete in this area of production?

2. Competition for the feeder cattle supply.

3. Corn Belt feeder cattle producer may finish his own feeders for market, or sell to others during periods of strong demand.

4. A beef cow dry-lot maintenance program may make it feasible to develop a program of fall calving as contrasted to the traditional program of spring calving.

Systems of supplying feed to cows under a dry-lot maintenance program.

1. Strict dry-lot maintenance, no grazing.

2. Dry-lot maintenance for the major part of the year with variations:

    a. Part time rough land pasture grazing to harvest, in this manner, forage growths from acreages not adequate to feed the herd during an entire summer growing period; pastures to be supplemented with dry-lot feeding.

    b. Essentially a dry-lot maintenance program supplemented by permitting the herd to fall graze 3rd or 4th crop growths from hay meadows or new seedings and to glean crop residue such as corn stalk fields.

1/ Presented by R. E. Jacobs, Extension Animal Husbandman, University of Minnesota, St. Paul, Minnesota, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

In a 1963 University of Minnesota, Rosemount Station, dry-lot versus pasture program for beef cows results were: (154 days on pasture)

	Pasture	Drylot
No. of cows	32	35
Feed cost per cow (1)		
Winter feed cost	$33.60	--
Pasture, native grass	2.5 acres (2)	--
Yearly feed cost	($63.00) (2)	$71.97
Feed Consumption		
Corn silage, lbs.	5,735	7,570
Hay	1,100	1,850
Grass silage	--	6,650
Salt & Minerals	free choice	free choice
Daily gain, 154 day pasture period, lb.	1.00	-0.16

(1) Feed Prices: Corn silage, $7.25 per ton; Alfalfa-brome hay, $21.00 per ton; Grass silage, $7.00 per ton. Total cost of wintering and dry-lot feeding does not include cost of bedding, labor, bull, interest and equipment.

(2) Writer assumes $12.00 per acre for rent.

DAILY NUTRIENT REQUIREMENTS OF BEEF COWS*based on air-dry feed with 90% dry Matter.

Weight	Desired av. daily gain	Daily feed	Total protein	TDN	Carotene	Vitamin A
lb.	lb.	lb.	lb.	lb.	mg.	units
Wintering pregnant heifers:						
700	1.5	20	1.5	10.0	50	20,000
900	0.8	18	1.4	9.0	45	18,000
1000	0.5	18	1.4	9.0	45	18,000
Wintering mature pregnant cows:						
800	1.5	22	1.7	11.0	55	22,000
1000	0.4	18	1.4	9.0	45	18,000
1200	0.0	18	1.4	9.0	45	18,000
Cows nursing calves, first 3 to 4 months:						
900-1100	0.0	28	2.3	16.8	106	42,000

*Adapted from National Research Council, Nutrient Requirements of Beef Cattle.

Non-Lactating Gestation Rations: assume 150 days for this period.

Non-lactation rations can include ground corn cobs; oats, barley or flax straw; corn stalks, fed as corn stalk silage or dry chopped stalks. Or, cattle can graze on crop aftermath which includes corn stalk fields. These low quality roughages should be supplemented with high quality forages or protein supplements.

Hamilton and Rusk of Illinois full-fed corn stalk silage (no ear corn included) to wintering beef cows for 139 days in 1922-23. The silage was supplemented with one pound of soybean oilmeal per day. Daily consumption of silage was 66.53 pounds; gain was .742 pounds per day.

This writer wintered cows at Iowa on cornstalk silage, hay and minerals, 1954-55. Average daily consumption:

Cornstalk silage, lb.	52.83
Chopped mixed hay	4.00
Corn (60%) - Mineral (40%) mix	.50
Block salt	.04
Daily gain per cow	.78 lb.
Feed cost per day	17.6 cents

Prices: Silage, $4.00/ton; hay, $20.00

Hulme, Utah reported a 150 day wintering with beef breeding cows, 1932.

	Lot 1	Lot 2
Daily Feed		
Alfalfa hay, ad libitum	35.6 lb.	--
Alfalfa hay, limited	--	10.0 lb.
Barley straw, ad libitum	--	17.6 lb.
Daily gain, lbs.	1.58	.446
Wintering cost per cow	$26.75	$11.45
Weight change per cow, after 45 days on pasture	16.0 lb.	+28.0 lb.

Iowa researchers recently substituted ground cobs for silage in wintering cows. Cobs were valued at $10.00 per ton and corn silage at $7.00. Four pounds of ground cobs valued at 0.5 cents per pound substituted for 13 pounds of silage costing 0.35 cents per pound effecting a saving of $3.45 per cow in a 138 day wintering period.

Dry-lot Lactation Rations for Beef Cows

Beef calves usually nurse for 6 to 8 months - an average of 7 months. Not the Nutrient requirement table. Cows nursing calves need 28 pounds of air-dry basis feed; this feed allowance needs to contain 2.3 pounds of protein and 16.8 pounds of TDN. This increase in nutrient need calls for separating the cows that have calved from those to calve later. To furnish this amount of TDN in 28 pounds of feed would require a combination of 16 pounds of good quality hay and 12 pounds of ground ear corn.

If we are to get the level of TDN needed without grain we will find it necessary to feed 34 pounds of good quality hay on the air-dry basis. This is essentially a full feed of hay. Silages may be included in the rations, but any combination of hay and silages should be provided on the ad libitum basis.

Dry-lot feed required per cow per year-air-dry hay basis with no grain:

150 days at 18 pounds per day	= 2700	pounds	(non-lactation)
120 days at 34 pounds per day	= 4080	"	(lactating)
95 days at 30 pounds per day	= 2850	"	
Total	9630	"	

The above gives us a requirement of 4.8 tons of air-dry basis forage needed to maintain a beef cow year round in dry-lot assuming no pasture grazing or crop residue available.

Performance of Calves - Dry-Lot versus Pasture

Iowa 1960 Cattle Feeders Day Report

	Dry-lot	Blue Grass Pasture	Grass-Legume Pasture
No. of calves	16	16	18
Birth Weight	73	75	74
Weaning Weight	437	452	476
Daily creep feed Consumed, lb.	7.49	2.7	2.23
Cost of Creep feed	$18.16	$6.54	$5.42
Cow feed cost, 365 days	$89.10	$57.10	$65.10
Cost per Calf to Weaning	$107.26	$63.64	$70.52

Minnesota, 1963 Creep feeding trial, June 3 to October 22, 1963 (141 days).

	Pasture	Dry-lot
Av. daily gain	1,82 lb.	1.55 lb.
Av. daily creep feed	2.86 lb.	4.19 lb.

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UP-TO-THE-MINUTE BEEF CATTLE NUTRITION RESEARCH 1/

Urea for Beef Cattle

Although research with urea in ruminant feeding has been conducted for over 70 years, the topic is one of immediate concern to nutrition specialists. The relative economies of furnishing nitrogen from oil meals or non-protein nitrogen (urea) are such that urea utilization is increasing and will likely continue to increase.

A summary of recent feeding trials involving urea utilization in finishing rations is shown in table 1. The average results of these trials indicate that rate of gain and feed efficiency were not affected when urea furnished 20 to 30 percent of the total protein in the ration. Feed costs were nearly always reduced by the use of urea.

Some of the major factors affecting urea utilization are:

1. Readily available energy.
   a. Most efficient and safest use of urea is realized in conjunction with full-fed or self-fed complete rations - high in energy.
   b. Molasses is commonly used as an energy source when urea is utilized in growing or maintenance rations. A commonly used mixture is 89% wet molasses and 11% urea, fed free choice.

2. Protein level.
   a. Large amounts of soluble protein decreases urea utilization. Rations containing 9.5 to 11% crude protein appear most efficient. Some evidence would indicate that corn protein combines well with urea because of their relative solubilities, zein being quite insoluble in the rumen.

3. Minerals and vitamins.
   a. When urea replaces a considerable part of the vegetable protein in finishing rations, proper balance and supplementation of minerals and vitamins become more critical. Urea contains no energy, minerals or vitamins.

4. Time.
   a. Urea is not a foreign substance to the ruminant since continuous re-cycling occurs through salivary production.

1/ Presented by Nelson Gay, Extension Livestock Specialist, Iowa State University, Ames, Iowa, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

Even so an adaptation period is necessary for best utilization by rumen organisms when high-urea supplements are used.

5. Age of animal.
   a. A functional rumen is necessary for NPN utilization. This occurs at 6-8 weeks or earlier under normal circumstances.

Present recommendations as to the amounts of urea which can be safely and efficiently utilized are:

1. One-third of the total protein in the ration.
   a. Finishing rations containing 10% crude protein and being consumed at the rate of 25 pounds per day could contain .76 pound protein equivalent from urea or .29 pound of actual urea.

2. Ten percent of the supplement by weight.
   a. Higher levels make for difficulty in mixing and handling in bulk equipment. High-urea premixes should be diluted or combined into the total ration before being handled as a normal supplement.

3. One percent of the total ration.
   a. Complete self-fed rations containing 1% urea by weight are producing satisfactory performance.

Current research would indicate that urea has little or no effect on vitamin A or carotene utilization by beef cattle. Neither does there appear to be any antagonistic relationship between urea and nitrate-containing feeds.

Table 1 Summary of Recent Results of Feeding Trials with Urea

Station	Percent Total Protein From Urea	ADG		Feed Efficiency	
		With	Without	With	Without
Auburn	--	2.45	2.46	--	--
Iowa	26	2.45	---	10.2	--
Iowa	25	2.50	---	7.4	--
Michigan	17	2.24	2.32	7.1	6.9
Minnesota	27	1.77	2.07	8.2	7.2
Missouri	--	2.39	2.26	9.6	9.8
Nebraska	--	2.57	2.57	7.4	7.6
Purdue	30	2.22	2.32	7.2	7.1
Purdue	30	2.56	2.56	6.5	6.5
Average	26	2.31	2.36	7.7	7.5

Table 3 Cost Per Unit of Energy

	TDN lb.	NEM megcal	NEP megcal	NEm+p megcal
Silage	2.5	1.78	3.85	2.46
Corn, shelled	2.5	2.1	3.08	2.47
Corn and Cob	2.22	1.88	2.71	2.22
Alfalfa	2.0	1.80	3.85	2.5

Silage	$10/T
Corn, shelled	$1.12/bu
Ear Corn	$1.12/bu.
Alfalfa	$20/T

Table 2 Energy Requirement And Cost Of Different Rates Of Gain*

Body Wt.	Megcal		Daily Gain. lbs.			
	Maint.	Prod.	0	1	2	3
400	3.58	1.58	6.7	11.0	15.3	19.6
600	4.85	2.13	9.1	14.9	20.6	26.4
800	6.02	2.65	11.3	18.5	25.7	32.8
1000	7.11	3.13	13.4	21.9	30.3	38.8

* Based on ground ear corn priced at 1.6¢/lb. and having .85 megal NEM $ .59 megcal NEP.

KANSAS EARLY LAMB PROGRAM 1/

I have been given the privilege of reporting to this section of the North Central States Livestock Specialist Work Shop the "Kansas Early Lamb" program.

Sheep production is not the major livestock enterprise in Kansas. It provides a 9 to 10 million dollar yearly income, while swine will return 80 million dollars and beef cattle 400-500 million dollars. Sheep have a place in Kansas livestock economy and deserve to be increased.

Kansas Sheep Population

Year	All Sheep and Lambs	Stock Sheep	Feeders
1965	539,000		
1964	665,000	442,000	223,000
1963	731,000	502,000	229,000
1962	880,000	566,000	314,000
1961	814,000	534,000	280,000
1960	756,000	494,000	262,000

Kansas ranked 18th in all sheep and lamb population January 1, 1965, and 4th in cattle population (5,159,000 - all cattle)

The programs of sheep production in Kansas are as follows:

1. Commercial ewe flocks - Spring lambing (Feb.-Apr.)
   - Fall lambing (Oct.-Dec.)

2. Feeder lambs fed in dry-lot or on wheat pasture for slaughter.

3. Purebred flocks for the production of breeding stock for flock improvement.

Early lambs in Kansas are not original with us. California is one of the leading states in the production of early lambs born in the fall or early winter and marketed in April or May. Records indicate the establishment of the rail marketing of fall lambs in California as early as 1898. Kansas started probably

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1/ Presented by V. E. McAdams, Extension Animal Husbandman, Kansas State University, Manhattan, Kansas, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

as early as 1937 with the shipment of Rambouillet ewes from Texas. Other states producing early lambs include California, Texas, Arizona, New Mexico, Kentucky, Oklahoma, etc.

We have taken advantage of the inherent early breeding tendency of the fine wool ewe as an important factor in fall lamb production, and secondly, the larger mutton breeds of rams produce satisfactory carcasses with added gross income.

The changing of the breeding season in ewes from October and November to June and July has been gradual and has taken place over a period of years. The extra nutritional requirements of ewes producing fall lambs have been largely overcome through the use of supplemental feeds and fall and winter pastures. The fattening of suckling lambs is a specialty operation and produces a specialty product. Rambouillet ewes are good wool producers and are also gregarious. Likewise, they possess hardiness and longevity. They tend to breed early (June-July), but they are not the best milk producers. The Rambouillet is reported hardier, breeds earlier, but is not as prolific as a black face or white face crossbred. We have found no difference in prolificacy in Kansas trials.

Sheep are sexually mature at 300 days of age. The minimum age of first heat occurs at the age of about 180 days. Young ewes of 300 days of age begin their breeding season at the same time as mature ewes. The season starts later in younger ewes. This explains in part why we prefer a 100 pound yearling ewe on May 15 as a replacement.

Weaning all lambs by May 15 is done to induce estrus. Sucking delays the start of the breeding season. The occurrence of twinning increases quickly and reaches a peak in November and then declines. We expect a spring lamb program to produce a large percentage of lamb crop.

Heaviest lambs are born the earliest. Our early lambs are the most profitable.

Evidence indicates light (length of day) is a factor in regulating the seasonal incidence of estrus. Environmental temperature, which is closely associated with light changes in natural conditions, suggests itself as a factor of possible importance in this respect. Breeding season may start earlier in the ewes which are kept under cooler environmental temperature during the summer season. Ewes responded in 46 days to cooler environment when it was provided.

Lowering the environmental temperature during the hot summer months is effective in preventing sterility in rams. Environmental studies with air-conditioned rooms have indicated improved ewe ovulation and ram semen quality.

The lowering of temperatures may affect the pituitary activity or some other mechanism.

It has been observed that Hampshires and Shropshires were least fertile on about August 1st. Fertility improved and peaked in September. Most native flock owners have difficulty with early breeding. There is evidence that breeding behavior in sheep is influenced by heredity. We do have a limited number of mutton breed flock owners who can manage for early lambs.

It has been observed that under proper management practices, and given the opportunity, some ewes come in heat, breed and conceive during any month of the year, with the possible exception of a period extending from the middle of January to the last of March. Some ewes come in heat, breed and conceive during the lactation period. The level of nutrition is also a factor affecting fertility.

Percentage of lamb crop is an economic factor. I believe most flock owners want to manage for a high percent lamb crop.

I note some interest in producing three crops of lambs in two years. This is projected with the aid of hormones, early weaning and off-season lambing. Such a program in Kansas would mean

One crop in season (fall)
One crop of summer lambs
One crop of spring lambs

I presented the idea to a county association a couple weeks ago. Flock owners were of the opinion that the present early lambing program was hard to beat, considering all points.

Bred	Lamb	Wean(10 wks.)	Sell
June 1-July 15,1965	Nov-Dec.,1965	February,1966	May(12 mos.)
Feb-Mar., 1966	July 5, 1966	Nov. 15,1966	Feb-Mar.
Nov.1-Dec. 15, 1966	Apr.1-May 1,1967	May 15, 1967	November
June 1, 1967			

The Kansas Program:

1. Purchase quality young open faced ewes with size. It is not economical to save ewe lambs for replacements in the flock.

2. Buy yearling ewes from the range states for delivery in early May with at least 50 percent fine wool breeding.

3. Use registered mutton-type ram.

4. Produce adequate supply of temporary and native pasture and quality roughage as this is foundation of the sheep program.

5. Produce fall lambs born in October, November or December by breeding ewes in June and July.

6. Creep feed lambs on sorghum grain and alfalfa hay 45:55 ratio. You may hand feed or self feed.

7. Market lambs grading U. S. Choice or Prime in late April, May or early June weighing 90-100 lbs.

8. For highest returns, market clean wool on a graded basis through your wool marketing cooperative.

9. Provide a program for control of internal and external parasites and diseases.

Kansas Farm Flock Calendar

1. Pre-flusing -- April 27 - May 4 -- 17 days
   1. 5 year test - 2 year favorable - 3 years not favorable
   2. 2# alfalfa hay daily - ewes lose weight

2. Flushing -- May 15 - June 15 -- 30 days
   1. Cereal pasture with grain 1# per day
   2. Buffalo pasture
   3. Dry lot - silage plus grain - alfalfa hay

3. Turn in Rams - June 1 - Sept. 1
   Keep rams cool
   Shear - short fleece
   Trim feet
   Pen daily
   Run out at night
   Feed rams well - alfalfa hay 4-5# (daily)
   grain 1#
   supplement 1/7-1/5#

4. Separate Rams - Sept. 1 - June 1
   1. Pasture

5. Rest Period Ewes - Sept. - Nov. 1
   1. Good pasture - Native
   Sudan grass
   Brome
   Cereal

6. Grain for Ewes - Oct. 1 to Lambing
   Young ewes - 1# grain
   Old ewes - ½# to 1# grain
   whole (if good teeth)

7. Lambing Season - Nov. 1 to Dec. 15
   1. Tag before lambing
   2. 1 to 1½# grain
   3. Dock - castrate - 7-10 days

8. Grain for the Lambs - December to marketing
   Sorghum grain + alfalfa hay
   45 grain - 55 alfalfa hay
   other formulations: pellets, excellent but expensive

Management

Early Weaning - 8 to 10 weeks of age
   1. Head lambs for May market
   2. Wean late lambs to get ewes back on schedule - May 15th
   3. Put ewes out on pasture - reduce ewe carrying cost
   4. Lambs easier to handle
   5. Costs more to feed lamb

Market lambs - late April, May, early June
   1. U. S. Choice and Prime
   2. Weights - 95 to 100#

Shearing - April, early May
   1. Shear ewes - April - May
   2. Shear late lambs in May

Facing - lambs - March-April
   Tagging ewes

Parasite Control
   External - dipping, spraying after shearing
   Internal - drenching
      1. Spring
      2. Fall

Research Program in Kansas

450 crossbred ewes - Colby Experiment Station

600 feeder lambs - Garden City Experiment Station

100 Crossbred ewes - Kansas State University

Purebred flocks

SLIDES

1964-1965	Lot	Lambs	Ewes
Colby	1	35% sorghum grain, 10% SBOM, 55% alfalfa hay — mixture weaned 8-10 wks	1# sorghum grain, 1¼# alfalfa hay, sorghum silage
	2	Cereal pasture, 45% gr. sorg. grain, 55% gr. alfalfa hay — mixture weaned 8-10 wks	Rye pasture, 1# grain, 1¼# alfalfa pasture
	3	45% sorg. gr., 55% gr.alfalfa — mixture weaned 8-10 wks	Standard
	4	45% sorg. gr., 55% gr.alfalfa — mixture not weaned	Standard
	5	Sorghum grain, Alfalfa hay(long) — not weaned	Standard
	6	Sorghum grain, Alfalfa hay +, NH_4O 1/4 oz. (20 days old) — not weaned	Standard
	7	High concentrate to lower SBOM 20-15-10-10 gr. sorg. grain 70-60-50-35 gr. alfalfa 10-25-40-55 — not weaned	Standard
	8	65% ground sorghum, 35% ground alfalfa — mixture not weaned	Standard

CROSSBREEDING RESEARCH WITH SHEEP AT WISCONSIN 1/

Combining breeds for more efficient lamb production is not new. Much of the industry in this country and others is based on this practice for obvious reasons. As the genetic composition of breeds change, however, and as new breeds are established, it is important to re-evaluate certain combinations of breeds for efficient lamb and wool production.

Crossbreeding research was started at this Station in 1954. This work was done on a number of Wisconsin farms. Suffolk, Hampshire, Oxford and Shropshire rams were mated to western, white-face ewes. The 120 day weights of the crossbred lambs were 70.8, 67.9, 65.4 and 63.1 lb. from the Suffolk, Hampshire, Oxford and Shropshire rams respectively. Suffolk and Hampshire crosses weighed significantly more than Shropshire crosses and Suffolks more than Oxfords in each of two years. There was little evidence of breed differences in carcass characteristics.

The next phase of study involved 1,228 lambs sired by Columbia, Corriedale, Hampshire and Suffolk rams and out of grade Hampshire ewes. This work was also done on Wisconsin farms over a two year period. Control was provided by straight-bred Hampshires. Columbia-, Suffolk-, and Hampshire-sired lambs differed little in weight at weaning. These breeds exceeded Corriedale-sired lambs by 2 to 3 pounds in the first year and by 3.5 to 7 pounds in the second year. Lambs from Columbia and Corriedale rams had significantly longer fleeces than Hampshire- and Suffolk-sired lambs. Suffolk-sired lambs tended to produce heavier carcasses than those sired by Columbia and Corriedale. Carcasses from Hampshire- and Corriedale-sired lambs tended to be shorter and to grade higher than those sired by Suffolks and Columbias.

The results of this study indicate that first-cross lambs of these breeds have no advantage over straight-bred Hampshires under Wisconsin conditions if all lambs are marketed. However, crossbred females are likely to excel in the combination of lamb and wool production.

Breed of sire differences among crossbred lambs at birth were determined from a two-year study in relation to dystocia. The lambs were first-crosses resulting from mating Suffolk, Hampshire and Shropshire rams to Western ewes. The characters studied on the lambs at birth were weight, head width, head

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1/ Presented by A. L. Pope, Professor, Department of Meat and Animal Science, University of Wisconsin, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

length and circumferences at chine and shoulder points. The characters studied on the dams at parturition were width at hips, width at pins and parturition difficulty which was believed to be due to shape, size or position of the fetus.

Shropshire sired crossbred lambs were significantly less in birth weight and in the sizes of various body parts than Hampshire and Suffolk sired lambs. The last two did not differ significantly from each other in any of the birth characters. These differences gave no evidence of being associated with dystocia.

Breeding Research at Spooner Station

This flock was established in 1936 with the purchase of Western ewes. Shropshire rams were used continuously until 1954 and all flock replacements were raised from this cross and subsequent crosses from Shropshire sires.

In 1954 an experiment was initiated to determine the usefulness of introducing Targhee and Hampshire rams into this flock.

The previous seven-year production of this flock had been exceptional. The average percent lamb crop raised was 164 with a range of 151 to 176. The average labor returns per ewe was $23.44 with a range of $33.51 in 1951 to $17.67 in 1954.

Phase I

In this two-year phase straightbred Shropshire and first-cross Targhee X Shropshire lambs were compared. Targhee X Shropshire lambs tended to be heavier at birth than straightbred Shropshires. The crossbred lambs had an average weaning weight of 7.34 lb. more than the straightbred lambs. Only 4% of the crossbred lambs died between birth and weaning while 8.5% of the straightbred lambs succumbed.

Phase II

During this second two-year phase, Hampshire and Shropshire rams were mated to straightbred Shropshire and Shropshire X Targhee crossbred ewes produced during Phase I. There appeared to be a slight trend towards a greater number of lambs born and raised by crossbred ewes. Lambs at birth from crossbred ewes weighed about a pound more than from Shropshire ewes. The average weaning weights were as follows:

Hampshire X Targhee-Shropshire = 71.4 lb.
Shropshire X Targhee-Shropshire = 69.5 lb.
Hampshire X Shropshire = 68.9 lb.
Shropshire X Shropshire = 63.4 lb.

The differences between the straightbred Shropshire and all other crossbred lambs were highly significant. There was no significant difference in staple length. The Targhee X Shropshire ewes

sheared significantly more than the straightbred Shropshire ewes. In each of the four years, wether lambs were slaughtered upon reaching desired weight and finish and carcass traits were measured. The results generally followed the same trend as was indicated for the weaning weights. Hampshire X Targhee-Shropshires were consistently superior. Carcasses from Targhee X Shropshire, Hampshire X Shropshire and Shropshire X Targhee-Shropshire were similar. Shropshires ranked below the crossbreds in almost every case.

During this four-year period the percent lamb crop raised averaged 156 and the labor returns averaged $16.34 per ewe.

Phase III

The 1959 and 1960 lamb crops were sired by Shropshire, Hampshire and Suffolk rams. The ewes were Shropshire, Targhee X Shropshire, Hampshire X Shropshire and Targhee X Shropshire X Hampshire. These data are not completely analyzed to date.

Phase IV

In the fall of 1960 a flock of 48 Targhee and 48 Suffolk ewes were obtained. The same number of Shropshire ewes that had their origin from the original Western X Shropshire cross in 1936 were matched with these two breeds. These three breeds were compared over a three-year period as were their reciprocal crosses. The evaluation of these breeds then included their use as sire breed and dam breed. In each year, three different rams of each breed were used making a total of 27 rams. This was done to obtain a wider sample of the breeds and to minimize inbreeding. A breakdown by breed of dam of reproductive and maternal performance follows: (all values in percent)

Trait	Shropshire	Targhee	Suffolk	Overall
Ewes lambing of ewes exposed (to ram)	95.5	93.0	89.2	92.6
Lambs born of ewes lambing	156.7	162.1	176.6	165.1
Lambs born alive	96.8	98.7	97.3	97.7
Mortality birth to weaning	14.7	7.0	16.8	12.7
Lambs weaned of ewes exposed	123.7	138.5	128.2	130.4
Lambs weaned of ewes lambing	129.6	148.9	143.6	140.8

While the Suffolk ewes appear to be more prolific the difference was not significant. The mortality from birth to weaning was significantly higher for the Shropshire and Suffolk than for the Targhee ewes. There was no significant difference between the other traits. Age of dam had no significant influence either on number of lambs born or mortality.

The overall average weaning weight (120 day) was 75.3 lb. for the 578 lambs resulting from this three-year study. An analysis by breeds and crosses was as follows, lbs: (after removing sex, type of rearing, year, and age of dam effects)

Dam \ Sire	Shropshire	Targhee	Suffolk
Shropshire	65.1	66.8	72.4
Targhee	73.0	73.0	79.4
Suffolk	81.8	82.2	84.2

Suffolk-sired exceeded Targhee-sired lambs by 4.66 lb. and Shropshire-sired lambs by 5.36 lb. at weaning. Differences by breed of dam were 7.61 lb. for Suffolks over Targhees and 14.62 lb. for Suffolks over Shropshires. These differences were significant.

Even though Suffolk ewes exceeded Targhee ewes in weaning weight of lambs, the Targhee ewes weaned a higher percent of lambs per ewe exposed. This resulted in only 2 lb. of lamb more per Suffolk ewe than for the Targhee. The pounds of lamb weaned per ewe exposed was 106, 104 and 84 for the Suffolk, Targhee and Shropshire ewes respectively. Lambs from all Targhee dams averaged 75.1 lbs. at weaning. Lambs from the Suffolk dams averaged 82.5 lbs. and lambs from Shropshire dams averaged 67.9 lbs. at weaning.

Since no differences between breeds in number of lambs born per ewe exposed were significant, one cannot assume other than equal numbers of lambs at birth.

Mortality of lambs was significantly different among the three dam breeds.

Shropshires raised 85% of their lambs to weaning, Targhees 93% and Suffolks 83%; therefore, 100 lambs born of Targhee dams would produce 93 x 75.1 lbs. lamb at weaning = 6984 lb. 100 lambs born of Suffolk dams would produce 83 x 82.5 lbs. lamb = 6847 lb. 100 lambs born of Shropshire dams would produce 85 x 67.9 lbs. lamb = 5771 lb.

In wool production, the Targhee ewes were significantly superior to the other breeds at all ages. The fleece weight means by breed and age of dam follow:

Breed	Age	Means[1].
Targhee	3	11.69[a]
Targhee	4	11.66[a]
Targhee	5	10.95[b]
Targhee	2	8.81[c]
Shropshire	3	7.87[d]
Shropshire	5	7.65[e]
Shropshire	4	7.47[f]
Suffolk	5	6.95[g]
Suffolk	3	6.92[g]
Suffolk	4	6.87[g]
Shropshire	2	5.73[h]
Suffolk	2	5.52[i]

[1]. All means differ significantly (P .05) except those followed by the same superscript.

Shropshire ewes were superior to Suffolks at all ages except two years of age when 3, 4 and 5-year old Suffolks were significantly superior. Two-year old Suffolks ranked last having significantly lighter fleece than two-year old Shropshires.

Breed differences among such carcass traits as loin-eye area and percent trimmed hind saddle were not apparent. Loin-eye area was then expressed as a ratio of chilled carcass weight and age at slaughter. Breed differences were significant only for the ratio of age at slaughter; the Suffolk, Targhee and Shropshire sired lambs ranked in that order in each of the three years. As a ratio of age, loin-eye area was significantly greater among Suffolks and their crosses than for Targhees, Shropshires or their crosses.

As a maternal breed the Targhee is superior to the others in lamb survival to weaning, wool production, effect on lamb body weight at birth and in staple length at weaning. Suffolk dams raise heavier lambs at weaning, but the increase in weaning weight is not sufficient to offset the greater percentage of lambs raised to weaning by Targhees.

The Suffolk is superior as a sire breed for weaning weight, and for rate of gain to weaning, as well as for those carcass traits exhibiting breed differences.

For overall production of lambs and wool, assuming both are important, the best two-way cross on the above evidence would be Suffolk X Targhee. A three-breed cross may well be better if the

crossbred dam shows heterosis for traits such as milk production and fleece weight. This phase of the study is now in progress.

Records are completed on the financial returns from the Spooner flock for 15 years (1948 - 1962 inclusive). The average lambing percent raised for the past eight years has been 142 and the 15 year average 152. The average labor income per ewe for the past eight years has been $15.59 and for the 15 year period $19.26.

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SUMMARY REPORT--LAMB AND WOOL PROMOTION 1/

Because of the traditional marketing pattern, lambs from the North Central Region are well covered by promotion efforts in the larger metropolitan areas of the Northeast and New York as well as the Great Lakes Area.

The American Lamb Council, a division of the American Sheep Producers Council, is currently promoting lamb in the larger metropolitan areas of this country where the present lamb users reside. Coupled with this program is a new market development program for lamb based on educational approaches. Its success or failure could well rest with the invaluable help of extension personnel.

Areas in which lamb has an average consumption rate of about four and one half or less can be developed into markets if an educational approach is used. Advertising, for example, in an average to low lamb consuming area has little effect for a product which might require some change in the eating habits of a consumer. These markets, therefore, must be acclimated to lamb and told how to prepare and serve it. At this point, advertising then might be more effective.

Wool is promoted on a nationwide scale through national consumer magazines. New developments in wool such as permanent creasing, washability, and lightweight wools are keeping this natural fiber at the head of the fashion parade.

The future of the sheep industry in the United States may well rest with the farm flock type of operation with trends indicating that the range flocks are becoming smaller in some cases, while farm flocks are becoming larger. Recent trends in developing a consumer preferred lamb carcass can prove a valuable asset to the industry if each region of the country will implement theory into practice.

New interest in promotion by producers can be invaluable by not only selling more lamb, but by letting the producer meet first-hand the person who buys his product.

The sheep industry needs a common program supported by all segments of the industry from production through to the ultimate consumer. The American Sheep Producers Council has

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1/ Presented by R. D. Biglin, Manager of Public Relations, American Sheep Producers Council, and B. E. Taylor, Manager of Market Research Department, American Sheep Producers Council, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

found that amazing results can be obtained from promotion where the extension service is active in assisting this effort. Where the extension service is active you see active producers, carcass shows, producer promotions, quality wool production, quality lamb production, better management, greater net income from sheep, and 150 percent lamb crops.

The good price for lamb, and the continued optimistic outlook for wool, makes it even more appealing to Midwest farmers, who must first think of lamb and wool production as more than a hobby or avocation, but one of the most profitable livestock enterprises today.

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THE NEXT TEN YEARS IN THE SWINE INDUSTRY 1/

There were more changes in the swine industry during the last 15 years than there were during all the years between the domestication of the hog and 1950.

What's going to happen during the next ten years? I wish I knew for sure.

There are two predictions that can't miss. There will be fewer hog farmers and the size of enterprise per farm will increase. A decrease in margin of profit per hog will follow the change in size of enterprise. The change in size of enterprise will not be as dramatic as that predicted by some people. Lack of good management and inadequate disease prevention will limit the number of hogs under a single management system, especially in the sow and litter enterprise.

The relationship of management and size of enterprise is mostly an unknown quantity. Farm studies of the past show that optimum return per animal occurs when the numbers of animals per farm are relatively low. This, however, is undoubtedly changing in favor of larger units as mechanization and modern technology are being employed.

Things to Come

Buildings and Equipment

1. Manufacturers and builders will continue to promote dramatic changes in buildings and equipment.

2. Research will continue to lag behind the developments of industry.

3. Many hog men will over invest and failures will be numerous.

4. There will be a gradual "shakedown". Ideas that do not stand the test in the field will be discarded.

5. A trend towards moderation and economy in buildings and equipment will be forthcoming.

1/ Presented by R. H. Grummer, Professor, Department of Meat and Animal Science, University of Wisconsin, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

Disease Control

1. Much progress will be made in the area of immunization.

2. There will be accelerated activity in the development of safe vaccines that can be administered orally.

3. There will be a trend towards using antibiotics at a higher level for shorter periods of time. However, FDA approval will retard change in this field.

4. SPF hogs will flourish in isolated areas, but general acceptance will be slow.

5. State and federal disease control and eradication programs will expand. The U. S. will be essentially free of hog cholera in 1975.

Genetic Improvement

1. More emphasis will be placed on gain and feed conversion.

2. Loin eye size will be gradually deglamorized.

3. Testing station participation will not increase unless a system of subsidy is introduced.

4. Artificial insemination will increase but will be hampered by the usual growing pains of a new program.

5. More progressive breeders will have herds that average 1.0 inch of back fat.

Specialization

1. Corn belt farmers will continue to eliminate farrowing as more quality feeder pigs become available.

2. The feeder pig industry will grow in the fringe cornbelt areas and the enterprise will be profitable for at least ten years.

3. Production of crossbred gilts for breeding purposes will increase.

4. There will be a trend to produce "tailor made" boars to be mated with "tailor made" females.

5. There will be sporadic ventures in super-specialization, such as, providing the service of "community farrowing" but these will fail because of disease problems.

Nutrition and Feeding

1. There will be very few new discoveries in basic nutrition.

2. Emphasis will be on quality and nutritional variation of ingredients.

3. Methods of feeding will receive attention but hog men will continue to practice the full-feeding of a dry feed.

4. Interrelationships of nutrients and minerals will receive research attention.

Marketing

1. More emphasis will be placed on "package" marketing, i.e., hogs will be grouped according to weight and grade.

2. Rail grade and yield will continue to struggle for recognition but will make relatively little progress during the next ten years.

3. Auctions by telephone could be the big revolution in the near future if packers would decide to discontinue country buyers and buying stations.

4. Generally efforts will be made to reduce the cost of marketing and to increase recognition of differential value of livestock.

5. Central markets will make considerable progress in overcoming tradition and will establish new services and modernize facilities.

Reproduction

1. Synchrinization of heat will be practiced in the field during the next few years. This will stimulate the use of A. I.

2. Advances will be made in the effect of environmental factors on litter size.

Breeds

1. Breed organizations will have greater financial problems. There will be a decrease in number of purebred breeders and breeding establishments will be larger.

2. Commercial-type producers of breeding stock and A. I. will cause a greater stress on the purebred industry.

3. Some breeds will continue to decline in importance.

The direction of the swine industry during the next ten years will depend partly on the teaching of extension specialists. The ensuing years will be critical because of the revolution that is occurring in the industry. Extension people should be bold in their leadership. This can occur only if they are well informed on research findings and practical application.

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REPORT OF PANEL DISCUSSION
Swine Section 1/

The topic given to the panel of the problems and changes in the swine industry opens the door to a vast area and certainly can not be covered in a matter of minutes. Being relatively new in Minnesota and the field of Extension, I do not feel competent to speak with authority on the entire field of swine industry. Being responsible for the swine breeding and the swine evaluation stations, I am familiar with this segment of the Minnesota swine industry.

I will briefly recap our testing procedure and make some comparison of various traits tested over the past years. The Minnesota Swine Producers' Association operates testing stations at New Ulm and Austin. The Austin station was opened the fall of 1957 and the New Ulm station opened the following spring. Since the New Ulm station has the greatest capacity of 98 pens, it has become the center of swine evaluation and also the center of swine activities in the state.

The preferred test entry is four barrows sired by the same boar with not more than two pigs from any one litter. Pigs under 70 days of age and weighing between 35 and 55 pounds are delivered to the station. Pens are started on test when the 4 pigs average 60 pounds; the pigs are self fed a standard corn-soy ration until the pigs weigh 200 pounds. Each pig is slaughtered at approximately 200 pounds and complete carcass information is obtained.

If a purebred breeder wishes to test boars he must enter one pen of boars and one pen of littermate barrows all sired by the same boar. Gilts will be accepted, however, corrections are made to a barrow equivalence for final reporting. It is suggested that boars are tested on-the-farm to get a greater number of boars available with adequate performance records. Selection must be done under the same conditions as production.

The basic weakness of the testing stations is that only a small sample of the herd can be tested and this sample may not be truly representative of the entire herd. Therefore most of our progressive swine breeders are testing as many as three pens per sire to evaluate their progeny. Through this process the breeder has an adequate sample to evaluate for such production traits as: A.D.G. and feed efficiency; carcass traits such as length, loin eye area and % ham and loin on a live weight basis. In order to

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1/ Remarks from panel discussion by Charles J. Christians, Extension Animal Husbandman, University of Minnesota, St. Paul, Minn. at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

get a good evaluation and minimum of 4 and preferrably 8 animals are needed per sire.

A change noted since the fall of 1957 has shown in the increase in A.D.G., feed efficiency, length, loin eye area, and % ham and loin. The same trend has occurred during the spring tests.

Minnesota Testing Station Results:

Slide 1 FALL

	1957	1960	1965
No. Barrows	27	156	20
Days - 200 lb.	146	148	146
Feed/cwt. gain	317	310	308
Carcass length (in.)	29.2	29.4	29.7
Backfat (in.)	1.74	1.56	1.52
Loin Eye Area (sq. in.)	3.58	3.98	4.14
% Ham and Loin	22.9	25.4	27.0

Slide 2 SPRING

	1958	1961	1964
No. Barrows	113	343	526
Days - 200 lb.	152	154	143
Feed/cwt. gain	303	298	287
Carcass length (in.)	29.3	29.6	29.7
Backfat (in.)	1.54	1.58	1.56
Loin Eye Area (sq. in.)	3.52	3.85	4.07
% Ham & Loin	22.8	25.0	26.8

What Are Some Of The Problems Encountered?

1. Being neighbors to Iowa, confusion exists among many of the producers as to the difference between our testing system, minimum requirements for boar sales and indices reported. It is suggested that uniformity of testing procedures be initiated.

2. Occurrence of stomach ulcers. Last year 4% of all pigs tested in the fall died from ulcers. These deaths occurred in all breeds.

3. Pork Quality
   a. 6% of the hog slaughtered exhibited soft watery pork.

   b. Little progress is being made to decrease the backfat, even though loin eye area and % ham and loin has increased.

   c. Carcass contests have generally shown an increase in leanness and decrease in backfat thickness. This may be due to feeding and management.

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SWINE ARTIFICIAL INSEMINATION IN WISCONSIN 1/

The development of a commercial swine A. I. service in Wisconsin has followed a long slow path. Research with swine artificial insemination was started at the University of Wisconsin in 1956. The first field trial was in 1959 and 1960. Although early results at the University of Wisconsin prior to 1959 indicated that satisfactory conception rate could be obtained under controlled conditions the conception rate from the first field trial was disappointing.

Forty-six percent of the sows and 35 percent of the gilts farrowed after insemination. The major varible in this trial appeared to be the proficiency of the technician. The technician proficiency as measured by farrowing rate ranged from 71 to 14 percent. A second field trial was attempted in 1962. Here again, farrowing rate was low--it being between 40 and 50 percent.

In September 1962 several changes in insemination technique and semen processing were initiated. The farrowing rates for September, October and November were 67, 70 and 75 percent respectively. Following this early beginning a commercial swine A.I. organization was established by Tri-State Breeders Cooperative in October 1963. This boar stud was located at Platteville, Wisconsin and designed to accommodate 16 boars from the Yorkshire, Poland China, Duroc and Hampshire breeds. Since it's establishment in 1963 this organization has undergone a rapid growth in membership and service and a consistant increase in farrowing rate. After one and one-half years of operation there are now 370 farmer members of the swine cooperative who are using A. I. service in a four county area around Platteville. There are two swine technicians employed who have in this period inseminated over 3,000 sows. Over 76 percent of the sows have farrowed from a single A. I. service with an average litter size of 9.5. Of the gilts inseminated over 70 percent have farrowed from first service with an average litter size of 8.3. The inseminations are with semen collected the day of insemination or semen stored for one day before insemination. This farrowing rate is considered comparable with that obtained from natural service.
It is difficult to know exactly what farrowing rate our hog farmers do get from natural service. One of the best studies comes from Michigan State University where 450 sows and gilts were bred either once or twice during estrus. Eighty percent farrowed from this breeding. On most of our hog farms a 70 to 80 percent farrowing rate from first service could be considered satisfactory.

1/ Presented by N. L. First, Professor, Department of Meat and Animal Science, University of Wisconsin, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

Considerably better performance has been obtained where the technicians employed by the boar stud did the work rather than the farmer himself. Over 1,000 additional services have been sold in this area and throughout Wisconsin and neighboring states to breeders who inseminate their own sows. Early records indicated that these breeders were averaging about 43 percent farrowing rate from the sows they inseminated. It is likely that today this conception rate is higher because the breeders achieving a low conception rate have not continued.

Sales growth data indicates that this organization is growing slightly less than two-fold each year. The number of sows inseminated in a period from October 63 to March 64 was 769. The number of sows inseminated during the same period 1964 to 1965 was 1,198.

While it is evident that this organization is obtaining satisfactory pregnancy rates--that it is doing a good job for hog farmers and growing at a rather constant pace, several major problems still confront the swine A. I. industry. The most immediate problem is that of achieving a sufficient number of services to provide a profitable business. In this regard the hog farmer must decide whether he can pay for the cost of insemination service through the marketing of more efficient hogs with carcasses of greater value and whether a closed sow herd wherein no new breeding stock are introduced is of value to him. It may take several years for the hog farmer to decide the real value of A. I. Service to his swine program. Although this is the foremost problem there are problems of lesser importance today, problems involving the efficiency and the economy of operating a boar stud.

Second, is the problem of breeding more sows on one farm at one time and estrus detection. It is now well recognized that much of the success some technicians achieve as compared to others is due to their ability to recognize when a sow or gilt is in standing heat and their ability to inseminate at the proper time during estrus. The results from one study indicated that 67 percent farrowed when the sows were in solid standing heat, 47 percent when they were in fair heat and 20 percent when they stood poorly for the technician at the time of insemination.

A summary of several research studies throughout the world indicates that the average sow is in heat for a period between 48 and 72 hours. There appear to be differences between research studies and within studies depending on whether sows or gilts are studied and perhaps also depending on the breed of sow. In one study the average length of heat for gilts was 55 hours and for sows 70 hours. In another study one breed averaged 48 hours for standing heat and a second breed 63 hours. Again, a summary of research from several countries and many research workers indicates that the average time of ovulation in the sow is between 30 and 43 hours after the beginning of heat. The data from two studies suggest that the time of ovulation may depend in part on

whether the female is a sow or gilt and also on the breed. The optimum time for mating after the onset of heat has been studied by four different authors. From these studies maximum conception rate was obtained within a time period of 6 to 30 hours after the beginning of heat. It would appear then from these data that mating the sow the second day of estrus should be an appropriate time for near maximum conception rate.

The greatest single cost item in swine insemination today is the transportation to the farm. If several sows could be inseminated at one visit the cost of insemination service could be reduced and service provided to more farmers. Additionally, if sows could be inseminated at a precise time prior to ovulation and their ovulation precisely controlled, improved conception rates should be possible. These and the benefits accrued to the farmer by having litters born at one time give good reason for synchronizing estrus cycles. If estrus cycles were synchronized, the hog farmer would be able to more efficiently use his labor and facilities at farrowing time, to have a shorter farrowing period, fewer sleepless nights, more uniform pig crop and should eventually market a set of hogs that would command more dollars on the market because of their uniformity. For these reasons it is likely that a successful technique for synchronizing estrus cycles would be a great aid to the hog farmer and to the artificial insemination industry.

Research studies concerning synchronization of swine estrus cycles are not new. Early studies with progesterone injections indicated that progesterone injected daily would suppress ovulation and that estrus synchrony could be achieved upon the withdrawal of the progesterone. Daily injections, of course, were not practical. In the early 1960's renewed interest in synchronizing estrus cycles was brought about by the availability of orally active progestational compounds. The orally active progestational compounds synchronized estrus cycles quite effectively, but resulted in a high frequency of cystic follicles on the ovaries of sows and gilts that were synchronized. In many research trials the frequency of cystic follicles exceeded 50 percent. Because the frequency of cystic follicles increased, fertility after mating was reduced.

More recently two approaches to synchronizing estrus cycles have shown considerable promise. One approach is that of a stilbestrol or estrogen treatment prior to the progesterone hormone--the result being a reduced frequency of cystic follicles and more satisfactory pregnancy rate. A second and very promising method involves the use of a drug material that is not a steroid hormone and whose use does not result in cystic follicles. This material is a dithio-carbamoylhydrazine commonly referred to as I.C.I. 33,828. It has been used to synchronize swine estrus cycles in England, at Beltsville, Maryland and here at the University of Wisconsin. The data from all three experiment stations are in excellent agreement regarding

the number of gilts coming into estrus during a three day period after withdrawal of the treatment and the pregnancy rate following treatment. Approximately 80 to 90 percent of the gilts so treated can be expected to be in estrus the fifth, sixth and seventh day after withdrawal of the treatment. The drug is usually fed for 20 days. From England 95 percent of 73 gilts were pregnant after insemination at a synchronized estrus, 71 percent of 35 gilts were pregnant after synchronization and insemination at Beltsville. At the University of Wisconsin gilts were inseminated at a synchronized estrus and 67 percent were found pregnant at the 25th day of gestation. The same conception rate was obtained after nonsynchronized control gilts were inseminated. There was no significant difference in litter size between controls and those with synchronized estrus. The drug seems to depress weight gain slightly in the gilt. This side affect, however, is not considered sufficiently serious to interfere with it's effectiveness as a material for synchronizing estrus cycles. While the use of this drug looks promising, research is continuing in order to develop ways that more gilts may be inseminated in a single day rather than spread over a three day period. It would also be desirable to have 100 percent of the gilts synchronized rather than 80 to 90 percent.

A third problem still of importance in swine insemination is the problem of a longer storage period for swine semen. Certainly, if techniques for synchronizing swine estrus were in use, the need for longer storage would be reduced. The problem of preserving the fertility of boar semen over prolonged periods is a difficult one. Data from a 1963 study here at Wisconsin indicated that 50 to 60 percent of the sperm cells are live and motile in some extenders when stored for as long as eight days. The life and motility of the cell apparently bear little relationship to the ability of the cell to fertilize an egg. The extender now being used at Tri-State Breeders does an excellent job for semen used less than three days after collection. Other extenders using carbon dioxide gas in room temperature storage have been demonstrated capable of maintaining fertility through four and five days after collection. In most cases, however, the fertility level is not as high as semen used the first or second day. The insemination industry particularly desires techniques that will preserve semen for periods longer than one week. This long time storage is desired in order that sperm cells might be collected during seasons of low use and utilized during peak periods when breedings would be at a maximum.

The cyclic nature of hog production and swine breeding suggest that this would be particularly desirable. Progress in developing techniques for the frozen storage of swine semen has been exceedingly slow. Research at the University of Minnesota has demonstrated that satisfactory cell recovery can be achieved after freezing boar sperm; however, fertility trials have also demonstrated that these cells are not capable of impregnating the sow.

Considerable research effort has been invested here at Wisconsin in studying the aging of sperm cells and the loss of constituents from these cells with aging. It is hoped that prolonged cell preservation may be made possible with a better understanding of the constituents lost in the aging process. In one study it was found that the aging of boar spermatozoa had a very definite effect on the probability of the swine embryo surviving in the sow after fertilization occurred. Results from this study where over 200 sows were used suggested that the hereditary material in the cell should be investigated. A recent study has shown that the D.N.A. of the boar sperm cell is lost when the cell is aged. D.N.A. is the major component of the hereditary material in the cell. We are also studying the loss of various ions from the cell as the cell ages and the changes that occur in the cell membrane when aging takes place.

A fourth problem presently existing with swine A.I. is the problem of efficient utilization of boar spermatozoa in the sow. This problem while not of great concern to the swine A.I. organizations today may eventually become the major problem. At the present 10 to 20 services can be achieved from one ejaculate of the boar. This is rather low efficiency if compared to the bull where 500 to 1000 services are possible from each ejaculate. One study here has shown that efficiencies comparable to the bull could be achieved if semen were deposited in the oviduct of the sow. Unfortunately the process of tubal insemination involves surgery and certainly would not have application on the farm.

Other studies have concerned transport and loss of the boar sperm in the reproductive tract of the sow, the transport of live and dead sperm and the transport of sperm by estrual and luteal sows. These studies have all been an effort to determine where the loss of cells occurred and the factors affecting the efficiency of sperm transport in the sow.

From one study it was found that sperm are lost rapidly from the uterus of the sow. Fifteen minutes after insemination half the sperm inseminated are recoverable from the uterus, by four hours after insemination most of the color and fluid of the extender have been removed from the uterus. By eight hours after insemination a large number of phagocytic leukocytes can be seen in the uterus. The sperm population in the uterus declines rapidly from the time of insemination until four hours after insemination, a rather low population exists from four to eight hours and by 24 hours there are virtually no spermatozoa recoverable from the uterus of the sow. These studies also indicated that the cells were alive and motile in the uterus through two hours with low and declining motility thereafter. Sperm were transported to the oviducts of the sows in less than 15 minutes and the oviducts retained live spermatozoa for more than 24 hours after insemination. It was found that both live and dead spermatozoa are transported to the oviducts of the sow in heat and that the estrual and luteal sow both transported spermatozoa to the oviducts.

The luteal sows (not in heat) however, were more efficient in retaining spermatozoa in the uterus. Solution to major problems in the efficiency of sperm transport in the sow will most likely involve bypassing the uterus or reducing its size and destructive effect on spermatozoa.

Research studies attempting to solve the problems I have mentioned will undoubtedly continue for many years. Certainly each small piece of evidence puts us closer to solution of each single problem. These problems are not insurmountable and it is quite apparent that many of them are problems needing solution in the future for the most efficient application of A.I. to swine production.

I would like to recall your attention to the fact that satisfactory conception rate and litter size are now being attained, that the cooperative has a sizable membership, and that a considerable number of sows are being inseminated on the farm and producing litters that have been well received and recognized at the market place and in the feed lot. It is evident that the hog farmer can expect benefits in improved carcass quality and feed efficiency and can reduce disease risk on his farm by the use of artificial insemination. His recognition of these facts and his willingness to accept A.I. service as a part of his hog production program are yet to be determined. The future of the swine A. I. industry depends upon the hog farmer's acceptance of this program and his response in breeding services in order that a commercial venture may grow in size sufficient for efficient operation.

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TECHNOLOGICAL CHANGES IN LIVESTOCK MARKETING 1/

Livestock marketing practices vary widely in the major areas of meat animal production in the United States. Producer groups have historically sought competitive market outlets that would recognize the value of outstanding livestock. Packers also have expressed a need for more efficient and economic procurement methods.

Recent developments in livestock marketing indicate that modern communications and technology can be advantageously incorporated into the marketing system. New technological pricing innovations utilizing telephone and teletype communications have been introduced by producer groups and market agencies. Noted among these market developments are the Ontario teletype hog market and the network of Tel-O-Auction or Tel-O-Markets in southern Wisconsin.

Because of limited time this discussion will briefly touch on the fundamentals and organization of only these two marketing programs. The plans are basically aimed at providing a competitive pricing mechanism. The programs are designed to merchandize livestock to the packing plant(or plants)that has the best possible price or wholesale outlet on a particular market day. The new methods are primarily concerned with improved pricing efficiency, yet retain a strong emphasis on operational efficiency in moving livestock and meat from the producer to the consumer. The competitive pricing mechanism is utilized to obtain the widest possible buying and pricing support for the animals to be sold. Both systems recognize the need for reducing the procurement operational costs of the packer, facilitating specification buying and yet selling producer hogs to their best advantage.

TEL-O-AUCTION:

A network of swine Tel-O-Auctions is located at Belmont, Dodgeville and Fennimore, Wisconsin. The sales are sponsored by the Southwestern Pork Producers Association jointly with the Modern Merit Markets, a division of the Wisconsin Feeder Pig Marketing Cooperative. Incorporated into the system are pooling, grading and communications techniques from Michigan and Virginia. During the first six months of operation over 40,000 hogs have been sold by Wisconsin producers to fourteen packing plants in seven states.

The Tel-O-Auction is a hog merchandizing method which combines

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1/ Presented by Richard Vilstrup, Extension Livestock Marketing Specialist, University of Wisconsin, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

grading, ownership co-mingling, the sorting into large lots hogs of uniform weight and grade, and telephone auction pricing. The method is dependent on the use of the simultaneous telephone conference call linking at least thirteen distant phone buyers in addition to possible ringside buyers.

Procedure Used:

1. Market hogs are delivered by the producer to convenient concentration points in Southwestern Wisconsin.

2. Upon arrival hogs are identified, graded, weighed and sorted by weight.

3. Hogs are co-mingled with other hogs of equal grade and value. Lots are made up in sizes and weight ranges to attract maximum buyer interest.

4. A simultaneous telephone conference call is then placed to all packer-buyers who have indicated an interest in bidding on hogs. Buyers are also eligible to bid from ringside.

5. A pre-established time is set for starting the bidding. Each buyer is assigned a number and bids are taken by number only. The auctioneer describes each lot by weight, grade and number of hogs.

6. When the final bid is accepted, the number of the buyer is announced, consummating the sale.

7. The hogs are then loaded and shipped to the packing plant buying the hogs.

8. There is no charge made to buyers. The only procurement cost of the packer-buyer is the trucking charge from the auction to the plant.

9. The farmer pays a commission of sixty cents per hog. This charge pays for the auctioneer, facilities, telephone advertising and other operating expenses.

The sponsors of the new market currently plan to expand the sales program. A similar telephone system called Tel-O-Market is presently operating at the Milwaukee market with seven commission firms co-mingling hogs consigned to the market.

Advantages listed for the system by the market agency:

1. Packer buyers can reduce country procurement costs in purchasing concentrations of graded hogs from their central office.

2. Packers can buy hogs by specification and according to the kind and grade of hogs needed.

3. Farmers producing superior hogs have the opportunity to sell on a graded and quality basis.

4. Producers can take advantage of the sales appeal of large, sorted and co-mingled lots.

5. Producers have the advantage of a wider range of packer outlets in selling hogs throughout the Midwest and Eastern states.

ONTARIO CANADA TELETYPE MARKETING SYSTEM

The Ontario teletype swine marketing system was established nearly five years ago. The central office of the Ontario Pork Producers Association is located at Toronto, Canada.

The Ontario marketing system is dependent on a network of teletype communications linking eighteen larger packing plants and one machine provided by the Association serving thirty smaller plants. A province market order voted by referendum requires all hogs to be sold under the system. Consequently, every hog in the province is sold competitively to the packer willing to pay the highest price.

Procedures Used:

1. Producers bring hogs to nearest collection points located throughout the swine producing areas in the province.

2. Managers of local collection points wire the central office in Ontario of the number of hogs in the drove.

3. At the central office the message is typed on the central machine to all buyers.
(Example) "75 Hogs Hamilton"

4. The "Dutch Auction" system is used with the bidding starting from the top.

5. A tape of prices in a declining order is then placed in the machine.
(Example: $29.95 .90 .85 .80 .75 .70 .65 .60 .55)
(Hogs are sold on a carcass weight based on the top grading hog)

6. Each machine in a buyer's office is equipped with a signal button to stop the machine (called a "panic button".)

7. The first buyer that pushes the button on his machine purchases the hogs. The central office operator then types a confirmation of the purchase price to the successful plant.

None of the other buyers are informed of the name of the purchaser; however,all are informed of the final price. The next lot is then typed on the central machine.

8. The drove of hogs is then shipped directly from the local concentration point to the buyer at the packing plant.

9. The plant purchasing the hogs pays the trucking costs from the local concentration point.

10. Final determination of weight, grade and trim is made by official government graders and representatives. Value is determined by the teletype price times final carcass weight.

11. A differential price is set in advance for hogs not meeting top grade standards.

12. During the period studied the commission for selling was set at forty cents per hog, paid by the producer. Three cents per hog was paid by the packer-buyer to cover the cost of marketing and teletype operation.

Advantages of the system listed by the Association:

1. Every hog in the province is sold competitively to the packing plant with the best order on a given day.

2. Procurement costs are reduced. Buyers located in packing plant offices are charged only minimal rates.

3. Final grades and weights of hogs are determined by neutral government graders and representatives.

4. Hogs are diverted directly from the local concentration point to the packing plant purchasing the hogs.

5. Every packer has an equal opportunity to bid on all hogs for sale in the province.

6. Duplication of market facilities has been drastically reduced.

7. More complete knowledge of procurement problems, grades desired and carcass improvement needed, has stimulated an extensive educational program.

SUMMARY:

It is essential that any new system be analyzed in its proper perspective. It must be recognized that the Tele-O-Auction and teletype methods are new and yet only a small part of a complex marketing system. Presently, the majority of the livestock is still sold by older conventional methods. It must be noted,

however, that these new systems have demonstrated the successful use of modern communications and organizational techniques, that the innovations may lead to further developments in livestock evaluation, use of photo-phone techniques, closed circuit T.V., ultra sonic measurement, and instantaneous market reporting.

It is the challenge of the market industry to constantly review the sound programs of the past and yet incorporate the new improvements of the future in further developing the modern marketing system.

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CONTROVERSIAL SUBJECTS - HOW DO WE DISCHARGE OUR EDUCATIONAL RESPONSIBILITIES 1/

In keeping with almost everything else in this changing world, our roles as Extension specialists are becoming more complicated. There are many reasons for this -- one of which is the increasingly complex nature of what we call agricultural policy. Every one of us who works with agriculture is concerned with agricultural policy. There are probably several of you here who can remember the good old days of Extension work when a county agent or a specialist could address himself to the job of teaching a farmer how to grow a better hog, for instance, without worrying about the economics of how the support price of corn would affect the costs of growing that hog; and without being concerned about the politics of what and how the corn support price would be determined. This all began to change back during the Great Depression. The federal government found it necessary to impose restrictions upon agriculture in order to influence farm income. Extension Service responded to the farmers' need for interpretations of government programs to help them identify their production and marketing alternatives, and thus Extension Service got well into the field of agricultural policy in a formal way. At first Extension workers were concerned almost exclusively with interpretations of programs. Then farmers began voting quite regularly in referenda to decide whether they would have acreage controls or marketing controls, or whatever. Then Extension workers became concerned with both interpretation of programs and the identification and explanation of alternatives. We still do a lot of this. Since 1939 we have had some 63 national referenda on wheat, cotton, rice and peanuts. There have been quite a number of tobacco referenda -- the most recent one was held last week when the flue-cured tobacco producing states approved a new program of acreage-poundage controls.

Our job with reference to the referenda is one of identifying and analyzing various relevant alternatives. People trained in economics are capable of doing this job. But in more recent years the responsibilities of Extension policy specialists have become much broader than production control programs. They are called upon to do educational work in rural planning and zoning, taxation, resource conservation policy, rural school organization, use of agricultural chemicals, foreign trade, and a multitude of other things which are of interest to rural nonfarm people as well as to farmers, and in many cases the city people also have an interest. The policy specialists have become public

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1/ Presented by Doyle Spurlock, Public Affairs Specialist, Federal Extension Service, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

affairs specialists and they are becoming increasingly involved with educational work in subjects of a controversial nature. They must deal in areas where the impact is not only economic, but political and social. In many cases Extension workers doing public affairs education have had little formal training in this area. But few of them are pure tyros. From the earliest years of the Extension Service, rural people have looked to Extension for some help with controversial public problems. The tempo of economic and social growth and change have greatly increased the need to provide such help.

Let's look for a minute at what we mean by public affairs education. A Scope Report task force, in 1959, defined public affairs education as education for citizenship. That definition sounds about broad enough to include anything that one might want to work on, doesn't it? The task force went on to say, "Its scope is measured by the educational needs of intelligent citizens concerned with public issues at every level of government," which still doesn't narrow the definition down much. So I am going to throw out a sort of working definition for our purposes here. It seems to me that a public affairs program is that part of an Extension worker's effort which is directed toward creating an environment which permits him to move a program forward. This environment is, among other things, an environment of better understanding. Now, notice that I am not saying that this is the public affairs program, or that it is the program of the designated public affairs specialist. I'm saying that each one of us, regardless of his specialty, is in part a public affairs man. And the program phase that I'm talking about is not a public relations program which seeks approval of a predetermined line of action. I'm talking about a program which has as its purpose the creation of sufficient understanding of public issues to enable the "public" involved or concerned to make an informed evaluation of issues, to recognize alternatives, and to assess the advantages and consequences of the various alternatives. And I would submit to you that the choices between alternatives are not going to be made solely on the basis of economic criteria. Here is one of the primary reasons why we have controversies over issues, even when the issues are well understood by the concerned public. The public's members put different weights upon the economic, political and social aspects of an issue. A farmer and a member of the Audubon Society, both equally well informed, are hardly likely to reach the same conclusions regarding the use of agricultural pesticides.

Here is where the situation begins to become a little bit thorny from the Extension workers' standpoint. He is doing educational work in an area where there is controversy -- where the issues are not clearly drawn -- yet he is expected to remain objective and unbiased. This obligation is set out very explicitly in the Scope Report which says, "It should be crystal clear that Extension's function is not policy determination. Rather its function is to equip better the people it serves, through educational

processes, to analyze issues involved on the basis of all available facts. It is the prerogative and responsibility of people themselves, individually or collectively, to make their own decisions on policy issues and express them as they see fit." 1/ I don't think that we can seriously argue with this Extension philosophy. We recognize the validity and the necessity of an objective, unbiased approach to our educational obligations. Yet it is particularly hard for those of us with a commodity orientation to divorce our teaching approach from some of our strongly held beliefs. Usually we are working under some pressure of time, and there hardly seems to be time enough to digress into a public affairs program along with the livestock production or marketing program. It is usually easier to state our own position or belief on a controversial issue and let it go at that. Yet most of us will agree that this is not fair to our clientele nor to Extension Service.

Unfortunately, the public affairs job is made doubly difficult by the farmers' general lack of understanding of public issues. Perhaps some of you heard Prof. Willard Cochrane's talk to the American Farm Economic Association at Chicago last December. 2/ Professor Cochrane described the economic literacy of farmers as "distressingly low." He believes that economic literacy of farm people generally was higher in the 1930's than it was in the 1960's. He said, "Most livestock producers, and many of their leaders, have no conception whatsoever of the indirect price and income support provided producers of animal products through the support of feed grain prices." A managed economy, such as we have in agriculture, cannot be run either effectively or smoothly if the managers (in this case, the farmers), because of economic, or social, or political illiteracy, cannot understand the consequences of their decisions.

This seems, at first thought, a rather harsh charge to level at our farmers. But I think that if we closely examine the farmers' understanding of pertinent public issues, economic and otherwise, we will find that understanding to be very low. The commercial farmer today is very knowledgable in agricultural technology, but on economic and political matters extending beyond his own farm or community, he is not nearly so well versed.

Here, then, is one of the big causes of controversy -- a misunderstanding or a lack of understanding of the implications of

1/ The Cooperative Extension Service ... Today: A statement of the Scope and Responsibility, April, 1958.

2/ Some Observations of an Ex Economic Advisor: Or What I Learned in Washington, a talk by Prof. Willard W. Cochrane to AFFA, Chicago, Dec. 29, 1964.

decisions by farmers, due largely to a lack of knowledge about the issues. I suspect that there is a lot more controversy brought about in our society through a lack of understanding of issues than there is that is due to differences in opinions of informed people.

It seems to me that Extension is to a certain extent remiss in its obligations in that farm people have not been given the educational background for making the decisions that they are required to make. We have taken scientific farming to the American farmer on a large scale, but we have too often forgotten that scientific application is essentially a moral problem. For instance, the chemist produces the knowledge of how to make and use an agricultural chemical, Extension specialists disseminate that knowledge, but what is finally done with that knowledge is the moral responsibility of the people.

There are certain administrative decisions that are necessary for effective public affairs work to be done in connection with our commodity programs. Most importantly, there must be the recognition that when a Land-Grant College teaches new technology, it has an obligation to help society make the adjustments -- not only the economic, but the social and political adjustments -- that will allow it to realize the full benefits of technical progress.

Extension has opportunities as well as responsibilities here. We can be rightfully proud of our contributions to progress in agriculture through the extension of technology. We must acknowledge our special responsibilities to help people adjust to this technology. It seems to me that, in view of the particularly rapid rate of introduction of new technology and practices into the livestock, dairy, and poultry industries, specialists in these areas will find many opportunities to either do effective public affairs work, or to point out the needs to other appropriate people on their Extension staff who can do the work.

Unfortunately, we have no panacea for settling our controversial ills. There is no procedure which can be outlined in a 1, 2, 3 fashion that will work every time or even most of the time. Each situation involves different people, different issues, and requires different techniques, once the controversy has warmed up. Sometimes the Extension workers must "fly by the seat of their pants." But we do have some experiences which are helpful in guiding us. As previously mentioned, Extension workers have been concerned with various controversial issues for a long time, but this has usually been a sort of local issues basis. In 1963 we had our real baptism by fire in the national wheat referendum. There were many who thought that Extension could not do an educational job on a nationwide controversial issue without being accused of partisanship and favoritism.

Certainly it was a challenge. There was an easy way out, if an out was desired -- that "out" was to simply duck the issue and leave it to ASCS, the farm organizations, and the press. But that would have been an abdication of our educational responsibilities, so the State Extension Services met the challenge head-on. They didn't please everyone. The displeased were mostly those who took a strong position for or against mandatory controls -- some thought Extension got too deeply involved, others thought we didn't go far enough. But when the referendum was over, most people thought Extension had done a good job. There can be little doubt that we gained considerable stature, both for our handling of the issues and for daring to tackle it in the first place.

It is interesting to note that no set, standardized approach was followed. Each state decided its own strategy and its own program. Some chose to discuss only a "yes" and "no" vote; others discussed the "yes" and "no" plus several other alternatives. But there were some consistencies from which we can draw clues for work on controversial areas of any Extension program.

The first principle is a general one, but perhaps the most important thing to remember in working in areas of controversy. J. B. Claar, who is now Director of Extension in Illinois, summed up this principle in his preface to a brochure on the wheat referendum. He said, "It is not Extension's job to make decisions for people -- to tell them what they should do -- but rather, through the process of education, to contribute to their ability to make their own decisions in an enlightened manner."

Director Arthur Schulz, in stating North Dakota's position, had some advice which is well worth the consideration of any Extension specialist. He said, "It was our position that we would not participate in any activity that had either partisan endorsement of partisan support, therby removing ourselves from possible criticism relative to partisan activities of either an affirmative or negative nature." In many instances, Extension specialists serve as secretaries of commodity groups, breed associations, etc. I have known several who did this and I can think of very few who have not become involved in partisan activities in these positions. When they do so, they do Extension a disservice. The individual may be improving his own immediate position, or as the political scientists would say, he may "be widening his political support", but in the long run he is not enhancing the Extension image.

What are some of the ways in which we can do our Extension job in areas where there is or may be controversy?

Obviously, the ideal way to handle issues that are potentially controversial is to do a thorough educational job beforehand so that many of the issues will be resolved through better understanding. But to do this requires several things. First, we

must have the time and the resources to do the educational work. Frequently we have neither. However, it is a fact that sometimes we spend more time and resources trying to resolve or quiet an issue after it has become heated than would have been required to do the educational job initially. And secondly, we may need a crystal ball to foresee some of the issues that will arise. Here in this second instance is an area where I feel that Extenstion commodity specialists can make a real contribution toward the public affairs effort to head-off controversy. Production and marketing specialists are in a good position to foresee the development ofmany problem areas. You see the research being carried on in feeding practices, in grading, in use of agricultural chemicals; you see the changes that are taking place in the products, in the market structure, and in other areas. You are, I think frequently in some position to project these changes and appraise their reception by the public. It seems that there are few dhanges or advances that work to the benefit of <u>every</u> group in our society. It would help the adjustment process if the effects of innovations could be projected, affected groups identified, and educational work begun before controversy arises.

But what about our responsibilities when an issue has become hot? In the 1963 wheat referendum which has been alluded to, several states noted that it became increasingly difficult to do an effective educational job as the date for the referendum approached. But this doesn't relieve us of our educational responsibilities, nor even dimish them. And there is still a lot of good that can be done by a well planned educational program in the midst of controversy. But this is the time that we must be especially careful to constantly assess our efforts and make sure that we are presenting unbiased facts which will help members of our audience reach their own independent decisions. This is an especially hard course sometimes for production oriented specialists who are accustomed to making specific recommendations. But people don't expect and don't want Extension to make their policy decisions for them. To suggest decisions is to run the risk of suggesting a wrong decision. This can be detrimental to the confidence which the audience has in the specialist and to Extension Service. People are quick to pick out a scapegoat for wrong decisions.

There are several areas in which more and better public affairs work needs to be done by people working with and interested in the livestock industry. Some of these areas are:

1. The use of agricultural chemicals, particularly certain feed additives, insecticides, and pre-slaughter tenderizers. The whole agricultural chemicals industry has just gone through a period of damaging controversy, due primarily to public misunderstanding. There is still a considerable amount of educational work that needs to be done, both with users and with consumers, to bring about a better understanding and to allay the public suspicions. There must be a continuing program of

public education in this area as new chemicals are introduced.

2. Sanitary inspection of food products and of the plants and other facilities involved in the handling of those products. In his Message on Consumer Interests to the Congress on February 5, 1964, President Johnson said:

> "Meat and poultry inspection. The inspection of meat and poultry products moving in interstate commerce effectively insures safe and wholesome supplies of these foods, but this protection does not extend to products sold within a State. Therefore:
>
> "5. I recommend legislation to insure that all meat and poultry sold in the United States -- intra-state as well as interstate -- is inspected for safety and wholesomeness, either by the Department of Agriculture or in cooperation with State authorities."

As American consumers have become better informed, consumers as a group are becoming more aware of the possibilities of achieving added protection in many areas. New organizations and agencies to represent consumer interests are coming into being. It seems safe to predict that consumer groups will press for the legislation recommended by the President in his Message on Consumer Interests. Extension workers have an obligation to inform producers, processors, and consumers of the issues and alternatives involved so that decisions can be reached with a minimum of controversy.

3. Foreign trade. As competition from developing and developed countries increases for the foreign agricultural market, there must be a better understanding of the whole foreign trade -- international policy complex by producers and marketers of agricultural products. I have referred to Professor Cochrane's statements regarding the farmers' economic literacy. It is in this area of foreign trade that farmers" economic literacy probably is lowest.

4. Food prices, particularly meat prices. As Extension workers, we must keep in mind more clearly hereafter that ours is now an urban society; and that food costs are one of the most politically sensitive items in the cost of living. Any conscious, purposeful action, particularly by government, to raise farm prices and thereby food prices, brings a flood of consumer criticism. We must be constantly alert to opportunities to better inform the consuming public about the operation of our livestock production and marketing systems, so that necessary adjustments can be made with less public controversy.

Summary

I believe that we will have more demands made upon us to do educational work on subjects and issues in the future which have elements of controversy in them. One reason that I see for this is simply that of more communications. We will have more consumer groups which will be looking into things that affect food prices, public expenditures, and the like. These groups will disseminate their findings. Whether these things become controversial depends to some extent on how well we do our educational job.

As we do livestock Extension work we must broaden our concepts of the job -- we must realize that we have responsibilities beyond the extension of technology. We have the obligation to do that educational work which will help people to better adjust to technical progress.

We have an obligation to keep ourselves above or outside of partisan issues, so that when controversy arises we can continue with an effective educational program to resolve that controversy. Nothing negates a person's effectiveness to do work in a controversial area as quickly as becoming a party to the controversy or being recognized as partisan.

We have an obligation to face up to the challenges of controversial issues rather than ducking them. Our experience in the 1963 wheat referendum and our experiences in doing educational jobs under other conditions of controversy, indicate that we can discharge our obligation and responsibilities when we approach them in the traditional Extension manner, i. e., objectively and with the purpose of educating people to make their own decisions.

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WORKING WITH SPECIAL AUDIENCES
Marketing Firms 1/

I am aware that some of you have a great deal more experience in some of the areas I will discuss than I; however, I will discuss our activities in Illinois in the area assigned to me and present the conclusions I have reached as a result of such experience.

First, let me say that we have always enjoyed excellent working relationships with the livestock marketing personnel in the Department of Agricultural Economics. This includes Dr. Robert Coppersmith, who is presently at Kansas State University, and our present marketing economist, Dr. Brice Kirtley. I do, however, envy the folks in Wisconsin who have a marketing economist with some training in animal science. Our two marketing economists were trained primarily in the field of economics.

In this paper I should like to discuss three general kinds of programs that we have had in Illinois. These are:

1. Joint programs for producers in cooperation with existing marketing agencies.

2. Programs for the education of existing marketing agencies (these programs did not involve producer groups).

3. Programs in which we were involved in developing new marketing organizations.

We have had at least two activities that I would mention in the area of joint programs with marketing agencies. The first one of these was the series of "Know Your Hog Contest" at the terminal markets in Illinois. In these contests we assisted market personnel in selecting either individual hogs or groups of hogs which were on display one or more days of a week in a prominent location in the stockyards. Patrons of the markets were encouraged to make estimates on the hogs of such items as length, backfat and lean cut yield. These estimates were recorded and we then assisted market personnel in securing cut out data on the hogs and in scoring the estimates that were turned in by patrons of these markets. The markets provided prizes for the patrons of the markets who participated in the contest. I would also comment that we felt that this activity also did a considerable amount of training of buyers and sellers on these markets.

1/ Presented by G. R. Carlisle, Livestock Extension Specialist, University of Illinois, Urbana, Ill., at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

The second activity in this area is the Area Market Hog Shows or Clinics which we have held the past three years in northern and central Illinois. In these clinics commercial producers were encouraged to bring one hog to the clinic. The hogs were graded at the clinic into one of five groups on the basis of estimated lean cut yield, were bought on the basis of these grades and then all hogs were slaughtered and a complete carcass cut-out secured on each hog. In the past year we had slightly over 400 hogs in four such clinics in northern Illinois. Again, we felt that this was an excellent activity in which market personnel were involved and we were also happy that we secured the participation by a large number of commercial producers who had never had a hog in any kind of a carcass show or demonstration previously. We have been quite gratified by the participation of the commission men on the Chicago Market in this activity.

The second area that I would discuss is programs for market personnel. This has been centered in two general areas. The first is evaluation clinics for buyers and sellers on the market. As one can appreciate, this does take some tact but our marketing specialists have been quite active in securing cooperation in this area. This has given us a good working relationship for the market personnel in the work in the area that I mentioned in the first class of activity.

The other activity in this area has been a series of educational meetings for market personnel. This has been a cooperative project between Missouri and Illinois in the St. Louis area in which production and economic information has been presented to the people operating on the market.

The third area, and one in which we have spent the large share of our marketing time, is in developing new marketing groups. This has included, as it has in many states, feeder calf sales, feeder pig sales, lamb pools and wool pools. I would comment that the lamb pools were established in connection with an existing marketing agency which, after the first year, completely assumed the operation of the pools and except for some educational activity with consignors to the pools we have had nothing to do with the operation of the pools in recent years.

The other three types of sales have involved two kinds of activities on our part. The first activity has been a good deal of advice and counsel on organization and management of the sales. This seems to me to be a very legitimate function of extension and I think one in which we can continue to work with all kinds of groups involved in this activity. The other activity in this area is that in the beginning we have taken an active part in the sorting or grading of the livestock offered for sale and the farm advisers in Illinois have taken an active part in helping conduct these sales. Again, I think this is a legitimate function of extension in assisting the organization to get started but I do believe that we should make every effort as soon as possible to

withdraw from the active conduct of the sales once the organization is on a sound ground. I think that it will be logical that the livestock specialists will be first to withdraw, and then farm advisers will probably withdraw at a later date.

I feel from our experience in Illinois that there are three points that I should like to stress in connection with these kinds of sales.

1. We have had good experience in the sales that have been most recently organized by using existing auction facilities. This has been particularly true in our cattle sales which have been developed in western Illinois. There are some real advantages as far as relationships with existing markets, and the fact that sale facilities will be much more adequate than if one starts with a bare piece of ground would lead us to believe that this is a good approach to take.

2. Start on a quality program which includes culling at the truck on the first year the sale is operated. I think that a lot of the true educational work of such an activity is done by the culler. In fact at times it looks like more work is done here than in the sorting activity although I think many of us like to believe that we are engaged in educational work when we are sorting the livestock.

3. This is my personal opinion. The day you start to work with a group that is interested in organizing a sale make it clear to them that there will be a day when they are going to be on their own and this day will be as soon as they have gotten a good start and are on a sound financial basis. I like to think that our feeder pig sales in southern Illinois in which we have completely withdrawn from the active conduct of the sales are the way the auctions should be operated. In fact in the sales down there farm advisers are now beginning to withdraw from the active operation of the sales, the sales have secured their own graders and extension is rapidly reaching a point where we will be doing what we should be doing, and that is working with these people on an educational program outside of the conduct of the sales.

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WORKING WITH SPECIAL AUDIENCES
Meat Processors and Retailers 1/

We have recently prepared programs for two special audiences in our state. They are the Milwaukee Meat Council and the Wisconsin Meat Processors Association. These cooperative programs are discussed herein very briefly.

Wisconsin Meat Processors

This association has approximately 300 member businesses who employ from one to fifteen people. They serve primarily rural oriented people and in our population centers serve urban people.

These meat processors do all kinds of work from slaughtering to complete smoking, curing and retailing.

The big opportunity for our service is to develop Quality Meat Contests and evaluation work with them with county and area staff.

Their problems are generally lack of size for efficiency, lack of technical know-how and the need for leadership for group representation in legislation, etc.

Our program with them has been one of advising and planning on an individual and group basis. They are presently interested in assisting with Quality Meat Contests in their own communities.

Working with their board of directors we have and are providing special workshops for them. These have been in the areas of live and carcass evaluation of meat animals and a sausage workshop.

Our staff in cooperation with Home Economics has provided programs for their annual convention as well as judges for their annual products show.

Meat Council

Recently our staff has been asked to supply programs for consumers in cooperation with the Milwaukee Meat Council. This section of our state has over one-third of the population of Wisconsin. This council has as members large and small packers, independent retailers and sausage makers.

This group has experienced difficulty in program direction and

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1/ Presented by Quin Kolb, Extension Meat Specialist, University of Wisconsin, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

leadership and has had very little contact and cooperation with educational agencies.

During this past year under more active leadership they have selected as their major objective, consumer education programs on meat. Cooperating with the Wisconsin Extension Service they have programmed:

1. Five to fifteen minute telecasts on meat selection and preparation.

2. A half hour television program on Outdoor Meat Cookery to be shown 2 times in the Milwaukee area (250,000 viewers) and in 6 other state locations.

3. A consumer information center on meat.

The consumer information center opens some new doors for our educational programs. It is planned in one of the largest shopping centers in Wisconsin during a special outdoor meat cooking feature. The center will feature:

1. Meat Industry personnel, meat specialists and home economists available to answer questions from people stopping at the Information booth.

2. A display of tender and less tender meat cuts and the basic meat cuts for identification and cooking information.

3. An outdoor meat cooking demonstration to attract attention to the center.

This type of information center is new to the extension service. We will be evaluating it for its value in educational programs. Specialists in consumer information will be using research programs at the center to objectively evaluate this new method of presenting information.

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WORKING WITH SPECIAL AUDIENCES
Breeders of Registered Animals 1/

There are various characteristics that each audience has, however, I will try to list a few that I feel are particularly applicable for the breeder of registered animals. First, the breeder of registered animals produces a perishable product. His end product must be superior in quality and yield a profit. This breeder will continue to produce his product in the same manner until someone shows him a way to do a more efficient job. Secondly, the breeder of registered animals is a salesman. He must have a sales pitch or gimic. This gimic may be anything from show ring winnings to a record obtained in a feeding test. Through this means he tries to sell his product at the highest obtainable price. In order to sell he must be able to communicate with his buying public. Thirdly, he is a buyer. In order to compete with other breeders, he must buy superior seed stock. He will continue to buy until he can no longer purchase sires that will improve his herd. At this point he will produce his own sires and new genes will be introduced through the selection of an outstanding female from an outside source. Fourthly, the breeder of purebred livestock must be a gentleman. The livestock raised is only as good as the integrity of the breeder.

WHAT IS THE RELATIONSHIP OF EXTENSION AND THE BREEDERS OF REGISTERED ANIMALS?

Having grown up on an Iowa farm that specialized in the production of purebred beef cattle and hogs, I remember that the main functions the extension worker had with the purebred breeder are quite different than they are at the present time. Twenty to thirty years ago, and in many cases today, the purebred breeders' contact with extension has been through the show ring and breed associations. He also has participated somewhat in the general production county meetings. These events have too often been more of a social event rather than a real educational opportunity.

We can still capitalize on the livestock show as a means of bringing some teaching points to the attention of the breeders of registered livestock. The introduction of the meat-type barrow shows have served a purpose of informing breeders of the real need for greater muscling and less fat in our swine. Many educators believe that these shows have served their purpose and that only the professional showman is taking the awards. This may be the case in some shows, however, who is to say that we

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1/ Presented by Charles J. Christians, Extension Animal Husbandman University of Minnesota, St. Paul, Minn., at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

have obtained the meat-type hog. A few years ago ham and loin percentage of 45 was unheard of. We may breed hogs with 50 percent of their carcass weight in their ham and loin. This last spring at the Minnesota Spring Barrow Show, the top pen of barrows yielded a loin eye area of 6.93 square inches, a Ham and Loin percentage of 44.97 and an average backfat thickness of 1.2 inches.

The purebred beef cattle and sheep producers are far behind the pork producer. Since this media has worked in the pork industry, greater emphasis could be placed on area and district carcass evaluation for the beef and lamb producers. In order to achieve this aim, cooperation is needed with the packing industry and the breed associations. A step presently is being made in this direction with the national lamb show that is to be held in Cedar Rapids, Iowa. Great attention is on this show and I believe others will follow.

The livestock show on the other hand is also inducing some poor management practices. Many of our research centers have presented data that overfeeding of females is injurious to the reproduction of this individual. If this livestock show is to be an educational event, let us make an all out effort to eliminate the showing of the mature breeding classes of females. I would suggest the elimination of beef cattle classes of junior yearling and above, the elimination of swine classes of junior yearling and above. In their place we might suggest a class of performance tested individuals that have been managed under the same environment. These individuals would be shown and then slaughtered. Complete carcass information would be obtained and these carcasses would be on display for public observation.

With the new era of increasing emphasis on maximum land usage the purebred breeder is now beginning to become aware of the importance of accurate record keeping. This has especially been true in the field of pork production and more recently in sheep and beef cattle production. The Extension Animal Breeding specialist has presented production testing programs that have been appealing and generally profitable for the purebred breeder. Through the personal contact and consulting in many instances the extension specialist and the breeders of registered animals have come in closer harmony. Through testing programs the extension specialist has made friends that are important to us, especially at appropriation time.

In the future with greater specialization and infensification the breeder of registered animals will need to do more testing of the breeding stock & give guarantees of not only healthy animals, but also genetically superior stock. The day of the seedstock multiplier is past & the proven performance tested seedstock producer is around the corner. This will tend to require the specialist to conduct more area schools with special emphasis on genetics & breeding practices. Also extension must do some research to find other means of communication with the breeders of registered animals.

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WHAT KIND OF AN EDUCATOR ARE YOU? 1/

A genius, a good guy, an empire builder, a loner, an insufficient, a team player, a leader, a hand sitter, a too busy, a bogged-down, a non-attainer, a follower, a supporter, a dominant, a planner, a thinker, or a real teacher --- Just what kind of an educator are you?

To assist us in considering this question, permit me to do two things: first, to state briefly some signs of our times in animal science education work with particular emphasis on Extension because this is the environment in which we are working; second, to speak briefly of self-evaluation as means of categorizing ourselves as educators.

Signs of our times which I see for Animal Science Extension Specialists are:

1. Cooperation of Extension Specialists with the Research and Training Staff of the University: The needs and opportunities for united use of all of Agriculture's resources of the University faculty is greater than ever before. Total integration of functions within the animal science field has been instigated on a formal basis on many campuses. Effective informal cooperation is essential to the success of all programs on all campuses regardless of the formal arrangements.

2. Team-Teaching: This is another way of saying we should use the inter-disciplinary approach. However, I believe team teaching can be very effective within disciplines as well as between disciplines. We also know that teams of university professors are working together in teaching on-campus courses.

3. Development of Information: Field research and demonstrations have been very effective tools for extension workers in some States. As extension employees funded by moneys appropriated for education, we must plan this development of information for the benefit of our clientele. In other words, we have a responsibility to restrict our involvement in applied research programs to the areas immediately important to the people for whom we work.

4. FES Study of Multi-county Staffing Patterns in 13 State Extension Programs: This study was conducted during this past year and was released to the State Directors by Administrator Davis earlier this month. The report points up

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1/ Presented by Frank H. Baker, Extension Animal Scientist, Federal Extension Service, at North Central Regional Livestock Extension Conference, University of Wisconsin, Madison, Wis., May 11-13, 1965.

changes in the role of State Specialists where multi-county staffing patterns develop. Acceptance of changes in role with changes in staffing pattern is vital to the future of individual specialists.

5. Animal Agriculture Needs Glorification as the Food-Producing-Arm of Our Economy: I believe that the ability to produce food is currently a major resource of our country. Our future as specialists working in disciplines of primary concern in food production may depend on our ability to tell the story of food production in the right way to all the people of our country.

6. Professional Improvement: Much has been written about the increase in the body of knowledge. Extension is seeking a higher level of specialization of its staff to meet needs and demands of clientele. Thus training and retraining should be continuous for individual specialists.

7. Time and Motion Study of Animal Science Personnel Activities: The Good Book says, "For unto whomsoever much is given, of him shall be much required; and to whom men have committed much, of him they will ask the more." I believe you can learn much about an individual and his work by examining his training, his travel schedule, his office routine, and the relative value of each of his actions to the total University program. Our administrators need these facts to justify continued commitment of resources to our area of work.

Against these signs of the times, let's consider our individual roles in the Animal Agriculture of the future. Of course, this Animal Agriculture must be "programmed for quality meat production".

Regardless of what image you select to characterize yourself, I have chosen one word to describe all of you --- the term "educator". This word keys back to a Latin verb (educare) used to denote action in the physical and mental development of youth. In our time, usage of the word "educate" has been directed to include academic pursuits regardless of age of the participants. Of course, the teacher or leader creating, motivating, and/or conducting the process of learning is the "educator". Thus, by this definition and by virtue of your source of livelihood (the Smith-Lever Act - appropriating money for education in Agriculture, Home Economics, and related fields), you are educators. I might develop an opinion as to the kinds of educators represented in this audience. Such an opinion would be subject to error and of little value to our group. However, a careful self-appraisal on the part of each of you can be highly important in your future and Extension's future, for you are Extension! I suggest you ask yourself the following questions:

1. Do I like people?

2. Do I start working with people where they are?

3. Do I help people identify their problems and examine relevant data?

4. Do I help people appraise and identify alternative solutions to each particular problem?

5. Do I help people weigh the consequences of the alternative solutions?

6. Do I permit the people themselves to decide on the course of action they need to take in arriving at the solution to the problem?

7. Do I assist and encourage people to follow through to the solution and evaluate the results of their effort?

8. Is there a positive change in people as a result of what I do?

9. Am I giving the best of myself and my talents to the people I serve?

10. Am I making maximum use of the resources (funds, facilities, and time) allocated to me by my employer?

A strong, sincere, and affirmative answer to all of these questions marks you as a truly great extension educator. The critics who raise questions about Extension's future will have no basis for the questions if extension workers continuously give their best. On the other hand, giving less than our best individually makes Extension vulnerable. Let me use an analogy.

In a little French village, a talented doctor had ministered to the physical needs of the citizens for all of his career. These were poor people who had paid him little. As he was to retire, the people wanted to do something special for him. Since they had no money, they chose to give the wine from their cellars to him. A plan was devised whereby on an appointed day, each villager was to place his contribution of wine in a barrel in the village square. All day long on that day, the villagers emptied their pitchers in the barrel. Finally, late in the afternoon, the barrel was delivered to the old doctor's door with appropriate statements of praise for his many years of service. When the crowd had departed in the dim of the twilight, the doctor filled a glass from the barrel. He stepped into the house and settled himself in his favorite chair to reminisce by the glow of the firelight. He took a sip from the glass and to his surprise it tasted like water. He rushed back to the barrel and

drew another glass. It tasted the same. He rushed to the mayor. A village meeting was called and then the story came out. Earlier that day every villager had said to himself, "I have so little wine for myself, I'll just put in a pitcher of water in the barrel. It will not be noticed in a whole barrel of wine."

And so, my colleagues --- I say to you --- the future of the Extension Service rests squarely with you as individuals and others like you, and their innermost dedication as Educators.

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